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13. ABSTRACT ***(Maximum 200 Words)***

The goals of this study were to evaluate the utility of the Total Army Injury and Health Outcomes Database (TAIHOD), to document and describe morbidity, mortality, and other outcomes among soldiers serving in the Persian Gulf; and to identify demographic, behavioral, and stress-related factors associated with excess morbidity as determinants of whether or not a soldier will develop a "war syndrome" condition subsequent to deployment or combat. Findings describe and compare the morbidity and mortality of deployed and nondeployed Gulf War Era veterans; identify key demographic, behavioral, and stress-related factors associated with excess morbidity or mortality among these veterans; document variations in health-related behaviors and stress among veterans; and measure associations between these behaviors, stress, and health.

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5. Introduction

The goals of this two-year study were to evaluate the utility of using the Total Army Injury and Health Outcomes Database (TAIHOD), an existing database containing health and administrative records, to document and describe morbidity, mortality, and other outcomes among soldiers serving in the Persian Gulf; and to identify important demographic, behavioral, and stress-related factors associated with excess morbidity as determinants of whether or not a soldier will develop a "war syndrome" condition subsequent to deployment or combat. We hypothesized that much of the variation in which soldiers experience Gulf War Illnesses (GWI) (i.e., health outcomes such as GWI hospitalizations, Comprehensive Clinical Evaluation Program (CCEP) registration, injuries, deaths, and accidents) can be explained by four main factors and interactions among these factors. The four factors are: 1) predeployment stressors, distress, functional status or health status; 2) predeployment health behaviors; 3) deployment-related stressors and distress; and 4) postdeployment behaviors and experiences. The specific aims of this study included describing and comparing the morbidity and mortality of deployed and nondeployed Gulf War Era (GWE) veterans; identifying key demographic, behavioral, and stress-related factors associated with excess morbidity or mortality among these veterans; documenting variations in health-related behaviors and stress among veterans; and measuring associations between these behaviors, stress, and health.

6. Final Report

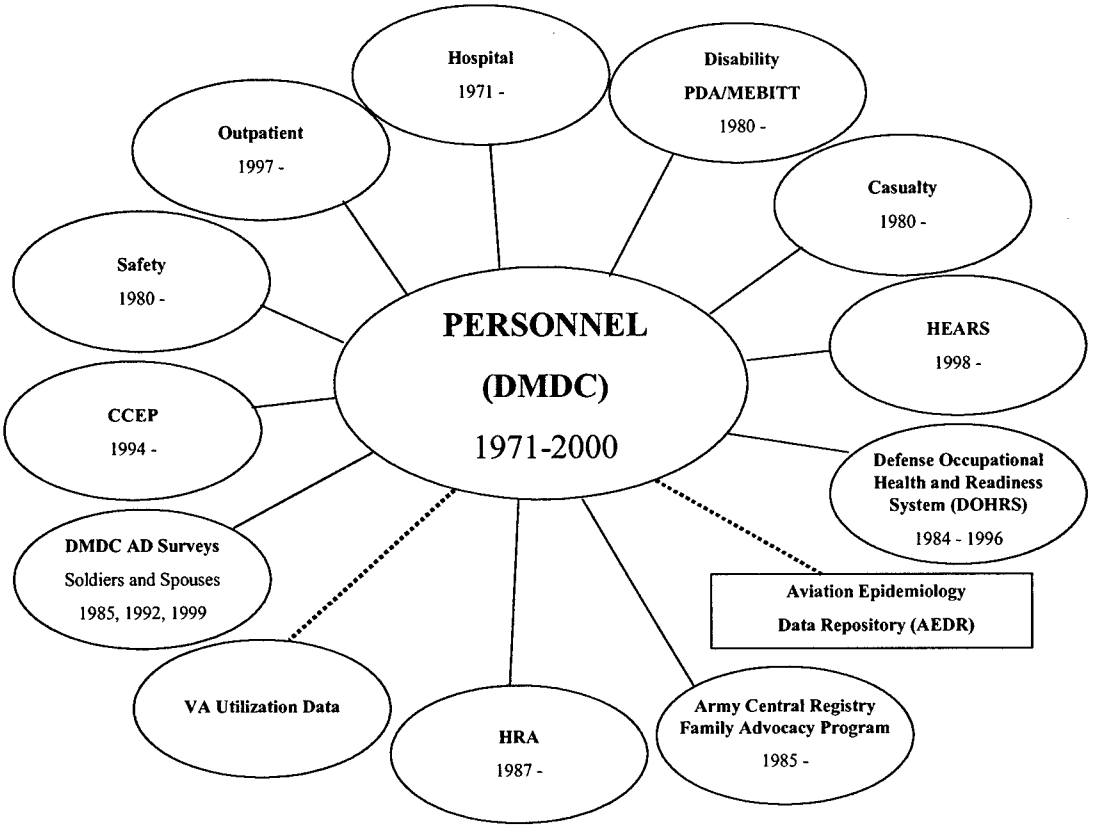
This section of this report describes our research efforts in more detail with reference to specific Statement of Work (Statement of Work) objectives. We also address the broader aims of our study, noting our most significant accomplishments and findings. As directed, we are including both positive and negative findings and results from these efforts.

Background

The TAIHOD comprises several linked data sources such as hospitalizations, deaths, disabilities, Gulf War activation files (documenting dates and duration of deployment to the Persian Gulf), health evaluations from the Comprehensive Clinical Evaluation Program (CCEP)*, Health Risk Appraisal (HRA) and Health Assessment Enrollment Review (HEAR) surveys of self-reported health behaviors, and personnel files for all Army soldiers who have been on active duty since 1971 (see Figure 1). A key purpose of this study was the evaluation of the TAIHOD as a research tool for the study of deployment related health, and in particular the potential etiologic role of stress in the development of Gulf War Illnesses (GWI). To this end we have devoted considerable resources to the scrupulous collection and linkage of data with the potential to shed light on the role of stress and other factors in predicting GWI among GWE veterans. We have examined and critically reviewed the individual datafiles and sources of information, many of which are used not only by our team but also by other research teams working in the Force Health Protection arena. Findings from these efforts are both discouraging and inspiring.

* The CCEP was established in June 1994, upon the directive of the Department of Defense, in order to evaluate Gulf War veterans who were concerned about their health, and to facilitate treatment for the myriad of complaints and conditions experienced by Gulf War veterans.

Figure 1. The Total Army Injury and Health Outcomes Database (TAIHOD)



The TAIHOD data used for this study include personnel files, documentation of deployment status, and records of all inpatient hospitalizations and outpatient visits and evaluations from the Comprehensive Clinical Evaluation Program (CCEP). The core of the TAIHOD includes detailed personnel records containing information about demographic characteristics, occupation, deployments, and separation from military service. Approximately a quarter of Army soldiers on active duty between 1990 and 1998 completed a Health Risk Appraisal (HRA) assessing measures of self-reported stress, distress, and risk-taking behaviors. These data have been linked to the TAIHOD and are an important component of the analyses conducted under this project. Construction of variables used in testing each hypothesis occurred after careful consideration of the availability and quality of the data.

An important aspect to this work was the careful and rigorous review and evaluation of health and demographic data present in the TAIHOD. Results from this work will benefit not only our own research but also has the potential to assist other researchers, as many of the administrative data sources contained in the TAIHOD are also used by other federally funded researchers working on Force Health Protection initiatives.

Nine specific hypotheses were explored:

1) that there is a baseline prevalence of the conditions most commonly included in definitions of GWI always present among active duty Army soldiers;
2) that individual characteristics and experiences of stress explain some variation in presentation of GWI in the general population independent of deployment to the Gulf;
3) that selection for deployment to the Gulf is nonrandom and occurs in such a way that those at greatest risk for development of behavioral or stress-related health problems are also those most likely to be deployed;
4) that the addition of deployment to the Gulf improves the model describing associations between individual characteristics, stress, and subsequent development of GWI;

5) that variations in stressors experienced during the war among deployed troops explain some variations observed among veterans in terms of who does and who does not ultimately present with GWI;
6) that the combination of information including prewar measures of health and stress, individual characteristics, deployment to the Gulf, and stressors occurring concurrent with the time spent in the Gulf, can be used to predict much of the variation in GWI;
7) that those who experience the greatest amount of stressors during the war are most likely to adopt risky health behaviors or to report higher levels of postwar distress;
8) that a deterioration in health behaviors and/or an increase in stress measures after the war correlate with an increased risk for adverse health outcomes; and
9) that effect modifiers of stress, distress, functional status, and health behaviors will improve the model's fit and facilitate understanding of factors key to predicting variation among those who do and do not develop GWI.

There were 7 deliverable "products" described in our final approved Statement of Work. These are detailed below.

Statement of Work Task 1

Document baseline rate of illness over time

Under this first objective we initially planned to measure the crude prevalence rate over the past 18 years among active duty Army soldiers for conditions most often reported by deployed GW veterans evaluated under the CCEP. We were to assess whether there was a significant change in rates of admissions immediately subsequent to the Gulf War (and whether the rates then return back to their baseline level), and identify any other points over past 18 years when rates had peaked. We requested a revision to our original Statement of Work objective in order to extend the period of analysis, because we obtained additional electronic records for inpatient hospitalizations from 1971-1980. This afforded us the opportunity to expand significantly (by more than 50%) the time period covered by the trendline with the potential for uncovering important links between the experience of illness and deployments *per se*.

The extended analysis increased the complexity of the task. Between 1971 and 1998 the Army used 3 different versions of the International Classification of Disease (ICD) codebook. Each switch to a new system brought about changes in how conditions were coded, often resulting in many more refined options for coding a condition that previously could only be coded in one, broad group. We consulted with Ms. Donna Pickett at the National Center for Health Statistics and also hired a highly experienced nosologist, Ms. Marjorie Zernott, to assist us in properly translating codes back to earlier time periods in order to plot trends in conditions across time periods. Our discussions with Ms. Pickett, as well as numerous discussions with current and former managers of the CCEP database have been helpful in clarifying apparent discrepancies in coding and constructing a unified trendline of deployment related conditions for the entire period from 1971 through 1998.

Administrative changes in the management of patients and diagnoses of symptom-based conditions have also posed a challenge to the construction of a single coherent trendline. For example, in the 1970s it was not uncommon for young enlisted soldiers who normally resided in the barracks to be hospitalized even for relatively minor conditions in order to provide custodial care. It was also common practice to create a hospitalization record for an individual who was assigned to quarters but who never was actually admitted to the hospital. Similarly, many clinic cases were given hospital records even though they were actually outpatient visits. Finally, it became apparent to us that day surgery cases (e.g., one-day admission for elective procedures such as vasectomies) were recorded as true admissions in Army hospitalization files until 1995; as with the other cases described, these needed to be accounted for carefully in order to make sure there was no artificial inflation of hospitalization rates due to these anomalous cases. We have applied the same rigorous data cleaning methods to this issue as we have to the rest of the database, and believe we have isolated "true" hospitalizations and that the trendline reflects the rates of hospitalization for conditions common among Gulf War veterans over a nearly 30-year period.

The complexities of using hospital data to study the health of military personnel have not been systematically reviewed or documented in the literature. In addition to the trendline analysis, we therefore included information regarding the uses, interpretations, and limitations of hospitalization data as they pertain to the health of deployed veterans in our promised paper. In addition to the above challenges and potential sources of bias present when using hospital data for the study of GWI we also found evidence of historical bias (e.g., rates of illness correspond not only with deployment dates but also with other significant events such as the initiation of the CCEP registry program and media coverage of military downsizing); instrumentation bias (e.g., lack of outpatient data has resulted in many researchers relying on hospitalization data as a proxy for illness, although hospitalization turns out to be a relatively insensitive measure that may overemphasize psychiatric conditions as a cause of morbidity while simultaneously undervaluing the relative importance of musculoskeletal disorders among deployed veterans); and healthy worker bias (i.e., many soldiers who did not register with the CCEP went on to register with the Veteran Administration's Persian Gulf Registry after they left the Army; the majority of these soldiers were symptomatic when reporting to the VA registry and were given a diagnosis other than healthy by the VA).

We have completed the manuscript included in this Statement of Work objective and it is currently undergoing peer review. A copy of the manuscript appears in Appendix A.

The TAIHOD includes records from the Defense Manpower Data Center on deployment to the Persian Gulf. Although deployment status is a key piece of information for the assessment of the health of GWE veterans, the validity of these data have not been formally assessed. Because the TAIHOD comprises existing datafiles collected for administrative or surveillance purposes, we cannot control the accuracy or the reliability of the data we receive. We can, however, evaluate the quality of the data we receive, and we have begun to explore the overall quality, completeness, and potential biases of the GW deployment activation datafile, even though this task was not specifically included as a Statement of Work objective.

After the Gulf War ended, the services did their best to create files that identified soldiers who were deployed to the conflict. These files were subsequently used by many researchers, ourselves included, to conduct epidemiologic studies of Gulf War Illnesses (1-23). To date, there have not been any published studies systematically evaluating the quality of these data, despite the fact that several researchers have noted anomalies in these files. Steele and her co-investigators on the Kansas Persian Gulf War Veterans Health Initiative Program reported an overall discordance between self-reported deployment status and military personnel records of approximately 7% (17). The degree of misreporting seemed, however, to vary among the study groups; 15% of the GWE veterans whose DMDC records indicated that they had not gone to the Gulf reported that they were in fact there. In a separate study of Gulf War veterans in the Pacific Northwest, McCauley et al. found that 8.5% of the soldiers who had deployment status records in the DMDC files reported that they had not actually deployed (24). Anecdotal evidence from some of these veterans suggested that although their unit had been deployed, circumstances had occurred that prevented them from being deployed with their unit. In a follow-up study, McCauley et al. contacted a sample of Gulf War veterans from the Pacific Northwest by telephone to interview them about their experiences. To their surprise, 274 (9%) reported that they were not on active duty in either the Army or National Guard during the war, and another 231 (8%) reported that they were veterans of prior conflicts (e.g., Vietnam), but that they had not participated in ODS/DS (25).

Because there is a possibility that misclassification error may have occurred with respect to deployment status and, even more concerning, that this error may have been systematic (e.g., National Guard or Reservists may have been more or less likely to be miscoded than regular active duty soldiers) efforts are underway to quantify the extent and potential impact of such misclassification. We propose a multi-site study to evaluate the extent of misclassification error and the impact it may have on published accounts of the effect of deployment on soldier health. Collaborating with researchers at other institutions will allow us to use multiple sources of data to more accurately assess both the magnitude and direction of any bias in whether soldiers have been defined as having been deployed or not deployed. We propose comparing our findings from our own comparisons of the CCEP files and the activation files with interview data on self-reports of deployment gathered by the Iowa Persian Gulf Study Group and the investigators working with the Fort Devens Cohort.

Statement of Work Task 2

Identify individual risk factors for GWI that are independent of deployment

Task 2 called for the identification of associations between individual characteristics (such as gender, age, race, occupation and rank) and subsequent development of Gulf War Illness. The task called for the development of measurements of functional status trait attributes (e.g., age-rank ratio, aptitude test scores, promotion rates), stressors (e.g., changes in marital status, numbers of dependents and changes in work), and distress (e.g. hospitalization for depression).

We have completed this task and have incorporated the results in the publication of a paper entitled "Demographic, physical, and mental health factors associated with deployment of U.S. Army soldiers to the Persian Gulf, " published in *Military Medicine* in 2000. Key findings from this work are described below under Statement of Work 5.

Statement of Work Task 3

Describe the history and utility of the HRA as a research tool for the study of deployment and health

Task 3 called for a technical report describing the history of the Health Risk Appraisal (HRA), sources of items and documenting what is known about the reliability and validity of the individual items therein. The HRA has been a useful source of information for this study but several limitations were uncovered as we learned more about the instrument; these findings have implications for its utility as a research tool. To our knowledge this information has not been systematically discussed in the published literature.

We have completed a draft of a technical report that describes how the HRA functioned in the broader context of the Army's Health Promotion Program, reviews what is known about the development of the questionnaire, and reports on military and civilian studies that have evaluated the reliability and validity of the individual items (either on the Army's particular HRA or on other HRAs that used similar items). A draft of Chapter 1 of this report appears in Appendix B. A final report will be sent once this draft has received final input from co-authors and clearance from the USARIEM review process.

Statement of Work Task 4

Document the characteristics of soldiers who did and did not take an HRA and describe distributional properties of their responses to HRA items

Efforts undertaken to address, in part, Statement of Work Task 3, will inform researchers about the sources of HRA items as well as any published validation and reliability studies that relate to specific items on the HRA. However, even if an item shows good reliability and validity in evaluation studies, to be useful the responses should also meet other criteria including: little missing data and, where data are missing, it should be randomly distributed in the population (no one group should be overrepresented); and it should show good distributional properties (i.e., there should be some variation in responses to the item in order to discriminate between different groups of people).

To better clarify the uses and limitations of the HRA we have produced a second technical report to document the generalizability of responses to the HRA items based on the populations who took the HRA, distribution of responses, and missing or extreme (atypical or "outlier") responses to key items. This information is potentially useful to other researchers who use the HRA survey but who may not be aware of the potential limitations and challenges to its use. A draft of this report appears in Appendix C. In short summary, while the HRA has several notable strengths, researchers using the HRA should be aware that:

First, the HRA database includes numerous duplicate and near duplicate records for individual soldiers completing a survey. In addition, the common practice of using an active duty sponsor's Social Security Number when a dependent completed the HRA makes it necessary to carefully evaluate each survey to determine first whether the respondent is in fact an active duty

servicemember (as opposed to one of his or her dependents) and second to determine whether the survey is a legitimate second survey or a duplicate/near duplicate resulting from a repeat scan of the original survey.

Second, researchers who use the HRA data must understand that the mechanism by which HRAs are administered is nonrandom and oversamples from some demographic subgroups, and that this oversampling varies from year to year. This is particularly apparent for the first 2 or 3 years during which the HRA was administered. In fact, it would probably be prudent to consider HRAs administered prior to 1990 as "pilot" surveys, and to use only HRAs administered in 1990 or later in epidemiologic research.

Third, it is strength of the HRA dataset that there is relatively little missing data, even for the more sensitive items. However, although the total proportion of respondents who skip sensitive items is quite small, those who do skip them are more likely to be from minority groups and slightly more likely to be male. A small portion of respondents report extreme, or outlying values on certain items (e.g., weekly alcohol consumption in excess of 30 drinks). These same respondents were more likely to express suicidal ideation, possibly suggesting they may indeed be at extremely high risk, or are perhaps deliberately misreporting extreme values in order to seek help or intervention from the survey administrator.

A final copy of this report will be sent once it has received approval from the USARIEM clearance process and we have completed investigation of irregularity in the numbers of HRAs administered during the fourth quarter of 1993 (when there appears to be significant drop-off in surveys).

Statement of Work Task 5

Document differences in demographic, occupational and health status of deployed and nondeployed soldiers in the prewar period

Under this task we were to compare the health, job, and personal attributes of active duty soldiers who were deployed to the Gulf to those who are on active duty but not did not deploy to the Gulf. The key questions being tested were: "Do those who are deployed take greater risks than those not deployed?" and, "Can some of the excess postwar morbidity be explained by differences in prewar health or behaviors?"

One manuscript was promised under this objective. However, we have completed and published two papers that pertain directly to this Statement of Work. The first paper, "Demographic, physical, and mental health factors associated with deployment of U.S. Army soldiers to the Persian Gulf," published in *Military Medicine* in 2000, demonstrated that Army soldiers who were deployed to the Gulf were happier and more satisfied with life in the prewar period than their non-deployed counterparts. Though tight control of Type I and Type II errors limits our ability to completely rule out chance as a possible explanation for this association, the consistent direction and magnitude of this association is suggestive. This paper also studied the association between deployment and adjusted odds of hospitalization in the prewar period. Though not statistically significant, deployed soldiers appeared to have been at decreased risk of any hospitalization or for hospitalizations for GWI in the prewar period, but at increased risk of hospitalization for injury hospitalizations. Our study of other risk-taking behaviors and indicators in the prewar period revealed that deployed veterans were more likely to report risk-taking behaviors such as drinking alcohol before driving, speeding, or not using a seatbelt, and were significantly more likely that nondeployed veterans to have received hazardous duty pay in the prewar period. These risk-taking behaviors and exposures may have contributed to the postwar excess injury mortality that we found in these analyses and which others have reported. Finally, this paper reveals that deployed soldiers were more likely to also have a spouse who was deployed --- a finding with important implications for dual-military couples, and those who are concerned about the stressors married soldiers may face in the context of deployment. A copy of this paper appears in Appendix D.

A second paper pertaining to this Statement of Work objective, entitled "Proposed explanations for excess injury among veterans of the Persian Gulf War and a call for greater attention from policymakers and researchers," was a commentary published in the journal *Injury Prevention* in 2001. It was later reprinted in the *Western Journal of Medicine* under the title, " Why are people who return from

war at increased risk for injury?" This paper addresses the relationship between injury and deployment that has been documented not only among veterans of the Gulf War, but also among Vietnam War veterans. This paper includes a model of the possible etiologic pathways that may explain this increased risk of injury, identifies important potential risk factors, and suggests possible prevention strategies to reduce this source of mortality among deployed soldiers. A copy of these papers appears in Appendix E.

Statement of Work Task 6

Evaluate the association between individual demographic and occupational factors and life events and subsequent risk for illness

Under this Statement of Work objective we were to identify associations between individual characteristics (e.g., gender, age, race, occupation, rank), job performance indicators, and life stressors and subsequent development of Gulf War Illnesses. The basic hypothesis for this paper was that the conditions GWE veterans commonly experience might be explained, in large part, by individual factors and situational stressors. Thus, even soldiers who are not deployed but who experience these stressors might be at greater risk for these conditions. The goal of this paper was to see if we could capture important markers for stressors or stress susceptibility and thus predict who was most likely to experience a hospitalization, particularly for those conditions of concern among veterans of the PGW, using the TAIHOD database.

Using a prospective cohort study design we followed 511,449 GWE veterans (deployed and non-deployed soldiers) from June 1991, through June 1994, (i.e., three years after the war). Eligible subjects must have been on active duty from December 1989, through June 1991. We used standard time-to-event statistical modeling techniques (e.g., Kaplan Meier curves, Cox proportional hazard models). This allowed us to control for varying amounts of follow-up time among individuals as they left the service during the follow-up period.

Under this effort our study team initially spent a great deal of time discussing how best to define illnesses of concern to Gulf War veterans, are so called "Gulf War Illnesses (GWI)." As a team we developed a measure that focused on hospitalizations for ill-defined, symptom-based conditions (based in part on the findings of Roy et al. and the CDC (26, 27)). However, some of our early analyses using this definition of GWI (e.g., looking at health outcomes among deployed and non-deployed soldiers in the immediate postwar period) suggested it did not discriminate well between deployed and non-deployed soldiers (in fact, non-deployed veterans appeared to be at greater risk for hospitalization from conditions found under this definition). After a great deal of debate we focused on conditions most prevalent among CCEP registrants with a diagnosis other than healthy. While this list of diagnoses derive from a self-selected population, the conditions do represent the experiences of veterans who are most concerned about their health, and the resulting list of conditions as applied to hospitalizations seem to discriminate fairly well between deployed and non-deployed veterans in the population of GWE veterans at large (including veterans who did not register with the CCEP program). However, in order to fully address to spectrum of health concerns and because we were interested in the role of noncombat factors as they predicted ill-health (that is among deployed and nondeployed soldiers) we decided to develop five separate models based on five different health outcomes: 1) hospitalization with any diagnosis; 2) hospitalization with a primary diagnosis in the psychiatric conditions group; 3) hospitalization with a primary diagnosis in the musculoskeletal conditions group. 4) hospitalization with a primary diagnosis in the signs and symptoms group; and 5) hospitalization with a primary diagnosis of acute injury/trauma. These same groups of interest also encompass the top diagnoses among those registered with CCEP. The top three groups of diagnoses found among CCEP registrants were in the musculoskeletal, psychiatric, and Signs and Symptoms groups, respectively. We included injuries as an outcome because they are the only documented source of excess mortality among deployed GWE veterans as compared to their nondeployed peers.

Risk factors studied include:

Individual Factors (as of June 1990):

Age; gender; race/ethnicity; rank; educational attainment; time in service; marital status; duty status and location of spouse (not married, married--spouse not on active duty, married--spouse on active

duty but not deployed to Gulf, married--spouse on active duty AND deployed to Gulf); number of dependents; and any move or Permanent Change of Station (PCS) that occurred in the six-month period prior to the war.

Life/Personal Stress Measures:

These variables included putative stressors, in particular changes that occurred prior to and throughout the war that might have created or increased distress. These were measured in December 1989, June 1990, December 1990, and June 1991. For example, we calculated the number of changes in marital status, number of changes in the number of recorded dependents, and an interaction between these two variables.

Job Factors/Stress Measures:

We constructed a variable that captured deviation from mean time in service for a given rank, with the expectation that those who have been at that rank and been in the service for a long time are not moving up as fast as their peers, possibly reflecting a performance deficit. This variable also captured newly promoted soldiers (at a given rank for very short period of time given total time in service) who we suspected might be at increased risk. Thus this variable may have a bi-modal distribution with respect to GWI. Because some occupations do not afford the same opportunities for promotion final analyses will account for this potential bias. We explored the potential role of working (duty MOS) in the job for which a soldier was perhaps not trained (primary MOS).

Preliminary Results

While work is still underway, preliminary results suggest that in unadjusted models deployment was significantly associated with an increased risk for postwar psychiatric and injury-related hospitalizations. However, deployed soldiers were at significantly lower risk for a hospitalization with a primary diagnosis in the Signs and Symptoms group of conditions. Some of this effect may be explained by demographic differences between the deployed and nondeployed population under study. Deployed soldiers were more likely to be male, under age 25, but of middle and upper enlisted ranks and they tended to have achieved a higher level of education than their nondeployed peers. Deployed soldiers were slightly more likely to have been married and, of soldiers who were married, the deployed ones were more likely to have a spouse on active duty. Once these factors were accounted for, in particular age, the influence of deployment on injury hospitalization was almost completely attenuated. However, the increased risk for psychiatric related hospitalizations remained. In addition, though the overall risk for any hospitalization was lower among deployers in the unadjusted model, deployers are at a slight, but significant increased risk in the post-war period once we control for demographic factors and prewar stressors. (See Table 1.)

Table 1. Univariate and Multivariate Cox Proportional Hazard Models: the Influence of Deployment and Prewar Stressful Life Events on Selected Health Outcomes of Gulf War Era Veterans, 1991-1994

Variable	Any Hospitalization	Injury Hospitalization	Psychiatric Hospitalization	Musculo-skeletal Hospitalization	Ill-Defined Signs & Symptom Hospitalization
Deployment Only	0.98‡	1.20‡	1.14‡	0.98	0.85‡
Adjusted Deployment*	1.06‡	1.06‡	1.13‡	1.02	0.98

* Influence of deployment after adjusting for change in unit assignment (e.g. PCS), change in number of dependents, change in marital status, low or high average time in service for rank, spouse's active duty and his/her deployment status, discordance between trained and actual job assignment (primary vs duty MOS), education, age, gender, rank, race, and MOS

‡ $p<.05$

Several prewar stressors were associated with increased risk for hospitalizations during the postwar period, even after accounting for the influence of demographic characteristics and deployment, though for the most part the effect sizes were small. A change in unit assignment (e.g., PCS) increased

risk for all five types of health outcomes but only reached statistical significance for injury-related hospitalizations and psychiatric-related hospitalizations as well as hospitalizations overall. Discordance between primary (the job for which one is trained) and duty occupational assignments (the actual job being performed) was associated with in an increased risk for psychiatric hospitalizations. A change in the number of dependents supported by the active duty member was associated with a significant increase in risk for musculoskeletal-related hospitalizations. Single soldiers were at lowest risk for hospitalizations overall. Married soldiers risks were at greater risk, particularly if the soldier's spouse was on active duty. Risk was highest for married soldiers whose spouse was also deployed to the Persian Gulf. The etiology of such an association is not clear. If it were related to stress or distress then we would also expect the association to hold for psychiatric-related conditions. In contrast, single soldiers (the referent group) appear at greatest risk for a psychiatric-related hospitalization in the postwar period. In general, being in a given rank for an excessively long time (longer than the other 80% of the cohort) increases risk for hospitalization in general, and specifically for hospitalizations related to Signs and Symptoms, and for musculoskeletal disorders. Soldiers in the referent group (those in their grade for a very short time—less time than 80% of their peers) are at lowest risk. On the other hand, risk for injury in the postwar period is lower among those in their grade the very longest, even after controlling for age and MOS. This might suggest that these soldiers are in their jobs for a long time and understand the risks well and may be, therefore, at lower risk for an occupationally related injury. It could also have to do with their behaviors and risk-taking, which could influence both injury risk and their promotability. Soldiers who scored lower on the Armed Services Vocational Aptitude Battery (ASVAB) test (a measure of verbal and numeric intelligence) were at greater risk for all adverse outcomes compared to those in the top quintile. This was particularly true for Signs, Symptoms and Ill-Defined conditions. (See Table 2.)

Table 2. Multivariate Proportional Hazard Models: Prewar Stressful Life Events, Deployment and Postwar Hospitalizations Among Enlisted Army Soldiers, 1991-1994*

Variable	Any Cause	Psychiatric	Injury	Musculo skeletal	Signs and Symptoms
Change in unit assignment (e.g., PCS)	1.05 (1.03, 1.06)	1.07 (1.00, 1.13)	1.03 (0.98, 1.08)	1.02 (0.98, 1.07)	1.05 (0.97, 1.14)
PMOS/DMOS mismatch	1.03 (1.01, 1.04)	1.09 (1.03, 1.15)	1.00 (0.95, 1.04)	0.99 (0.96, 1.03)	1.01 (0.93, 1.08)
Change in # dependents	1.02 (1.00, 1.05)	0.95 (0.86, 1.05)	0.99 (0.91, 1.07)	1.10 (1.04, 1.17)	1.02 (0.90, 1.16)
ASVAB Score					
1-34	1.06 (1.04, 1.07)	1.10 (1.01, 1.23)	1.13 (1.04, 1.22)	1.16 (1.09, 1.23)	1.25 (1.09, 1.42)
35-48	1.10 (1.07, 1.13)	1.18 (1.08, 1.29)	1.13 (1.05, 1.21)	1.12 (1.06, 1.19)	1.32 (1.17, 1.49)
49-60	1.09 (1.06, 1.12)	1.21 (1.10, 1.32)	1.13 (1.05, 1.22)	1.13 (1.07, 1.20)	1.24 (1.09, 1.41)
61-76	1.06 (10.4, 1.09)	1.15 (1.05, 1.25)	1.07 (0.99, 1.14)	1.09 (1.03, 1.15)	1.09 (0.96, 1.23)
77-99 (Ref)					
Spouse Status					
Single (Ref)					
Spouse not AD	1.04 (1.02, 1.06)	0.95 (0.89, 1.01)	0.86 (0.82, 0.90)	1.05 (1.00, 1.09)	1.04 (0.95, 1.14)
Spouse AD not Gulf	1.09 (1.05, 1.13)	0.93 (0.80, 1.09)	0.88 (0.77, 1.01)	1.00 (0.91, 1.10)	0.95 (0.89, 1.14)
Spouse AD in Gulf	1.13 (1.07, 1.18)	0.80 (0.62, 1.02)	1.04 (0.85, 1.27)	0.95 (0.82, 1.10)	0.93 (0.71, 1.23)
Time in Grade					
Shortest (Ref)					
Short	1.01 (0.99, 1.04)	1.02 (0.94, 1.10)	1.01 (0.95, 1.07)	1.03 (0.98, 1.09)	1.08 (0.96, 1.20)
Average	0.99 (0.97, 1.01)	0.90 (0.83, 0.98)	0.96 (0.90, 1.02)	1.03 (0.97, 1.08)	1.09 (0.98, 1.22)
Long	1.00 (0.97, 1.02)	0.92 (0.85, 1.01)	0.93 (0.87, 1.00)	1.08 (1.02, 1.14)	1.04 (0.92, 1.17)
Very Long	1.02 (0.99, 1.04)	0.93 (0.85, 1.03)	0.91 (0.85, 0.99)	1.08 (1.02, 1.15)	1.17 (1.03, 1.32)

* Adjusted for age, gender, race, rank, MOS (job), education and deployment

We will be doing some validation testing of these measures using stress and distress measures from the HRA surveys taken from the population at large (in order to have adequate power). We also plan to develop a composite stress score using life change events (described above) but will complete validation testing first. Once these steps are completed, and the paper has received review and approval from the USARIEM chain of command, a copy of the manuscript will be sent to U.S. Army Medical Research and Materiel Command. We also indicated in our revised SOW that we would conduct secondary analyses using the SAS Enterprise Miner tool (Data Mining) to evaluate the models developed above. This step was initiated but seems unlikely to result in output unique enough to warrant development of another manuscript. Relevant results from data mining efforts will be included in this manuscript. Similarly, results from models focusing just on deployed soldiers will be included in this paper rather than a separate manuscript.

Statement of Work Task 7

Evaluate the utility of the TAIHOD as a tool for the study of deployed veteran's health

The overriding purpose of this project was to evaluate the TAIHOD as a research tool for the study of Gulf War veterans' health and, more directly, as a tool for the study of health in an operational setting (deployments). A technical note describing the utility of the TAIHOD as a research tool for the study of deployment/war-related conditions is nearly completed. It details the strengths and weaknesses of this research tool.

We believe the TAIHOD may be particularly well suited as a tool for the study of war-related and postdeployment non-battle injuries, because it was originally developed specifically to study injuries and because we have continued to add data that will allow us to investigate a rich and varied host of potential risk factors (e.g., other deployments, occupational stressors or problems, personal risk factors, AEDR data on aviators, and health risk behaviors) as well as health outcomes (e.g., outpatient visits, experiences of family violence). In addition, much of our research team's prior experience and training has been in the field of injury epidemiology. Because injuries are currently the only documented source of increased mortality among deployed GW and Vietnam veterans (10, 22, 28-36), the TAIHOD and our research team are uniquely poised to conduct analyses to identify important risk factors and effect modifiers and to clarify the types of injury outcomes that are more likely to affect deployed veterans. Future analyses may focus on this important health outcome among deployed soldiers.

The report also details some of the challenges and complexities involved in using any of the individual databases currently included in the TAIHOD. Many of these data sources are also being used by other researchers who may not be fully aware of some of the difficulties related to the use of these databases. The report details some of these potential pitfalls and will be of use to researchers using Army administrative and surveillance data such as hospitalizations, outpatient records, HRAs, personnel files and other databases. We are awaiting comments from co-authors and final clearance from USARIEM, and will send a copy to USAMRMC under separate cover when it is complete.

7. Key Research Accomplishments

- Took special steps to evaluate the integrity of newly acquired datafiles before linking them to the TAIHOD.
- Initiated process for obtaining new data on occupational satisfaction, stress, and related factors that may also influence risk for Gulf War illnesses
- Obtained new data on important health outcomes (family violence data from Army Central Registry, Aviation Epidemiology Data Registry (AEDR), linkage to Veteran's Administration in-patient, outpatient, and death records). Although not promised under this grant, this is a logical extension of our work and will be included in future work funded through other sources.
- Organized a multidisciplinary team of talented individuals with particular expertise in injury epidemiology and experience working with Army administrative data.
- Documented the history of the Army's Health Promotion program, including a comprehensive summary of the survey items on the Health Risk Appraisal questionnaire.
- Documented characteristics of those who completed an HRA and those who did not. Noted demographic associations with patterns of missing responses to key items (e.g., indicators of alcohol misuse or abuse).
- Documented associations between self-reported high-risk behaviors and demographics, particularly for respondents offering very extreme responses to these items. Noted that though these responses are often extreme they may represent help-seeking (e.g., extreme levels of alcohol use are associated with increased reporting of suicidal ideation) and/or reflect actual health behaviors (heaviest drinkers also more likely to say they drink and drive and were more likely to be young, males—the group other studies have found to be heaviest drinkers).
- Discovered that prewar prevalence of stressors and self-reported distress are lower among soldiers who deployed to the Gulf than among soldiers who were on active duty during the entire Gulf War period but were not deployed to the Gulf.
- Documented prewar risk-taking behaviors and risk exposures among soldiers who deployed as compared to those who were not deployed to the Gulf, and found evidence of a modest elevation in risk-taking behaviors among deployers.
- Documented lower rates of prewar hospitalizations for conditions commonly reported by Gulf War veterans among those who deployed than among those who did not deploy.
- Established that prewar hospitalizations for injuries appear to be greater among soldiers who were deployed to the Gulf as compared to Gulf War Era veterans who were not deployed to the Gulf. This is suggestive of increased risk-taking behaviors and/or risk exposures (e.g., occupational, recreational) and may explain, in part, the excess injury mortality observed among veterans of ODS/DS during and after the war.
- Identified a gap in research related to rates of injury mortality among Gulf War veterans. Developed analytic model and published a paper outlining hypothesized pathways to explain the association between deployment and injury. Recommended a change in policy and funding incentives to devote more attention to excess injury morbidity and mortality among deployers.
- Compared CCEP to DMDC records for activation to the Gulf War theater of operations and demonstrated inconsistencies. Also discovered administrative decision made regarding the CCEP data that had a profound effect on our ability to evaluate these data for quality and completeness.
- Identified a lack of information regarding data quality, even for data widely used by many researchers focusing on the health of Gulf War veterans. We are forging collaborative alliances with other research teams to validate the integrity of commonly used data sources.
- Identified measures of stressors using existing data (in lieu of HRA measures) and tested utility of these measures in explaining variation in hospitalizations for Gulf War illnesses.
- Found evidence suggesting that life stressors, such as being married to an active duty servicemember who is deployed, experiencing a change in the number of dependents, and a job change prior to the war, are associated with postwar illness, independent of the influence of deployment (even after controlling for demographic factors and other potential confounders).
- Found evidence suggesting that time-in-service for soldiers of a given rank, as compared to peers of the same rank, may be related to postwar illnesses where those in that rank for the longest

durations are at greatest risk of illness; those in that rank for a shorter amount of time are at lowest risk. This association is reversed for injuries, however, with soldiers in the rank for the longest period of time (as compared to their peers) at lowest risk for injury. This finding deserves further study.

- Extended analysis of hospitalization rates for Gulf War-prevalent conditions to include entire period from the 1971 through 1998. Noted increased rates of illness following redeployment from Vietnam as well as following the Gulf War.
- Investigated and reported results from study of threats to validity and sources of bias in the use of hospitalization data for the study of Gulf War illnesses.
- Demonstrated that studies of GWI that utilize data on inpatient hospitalizations alone will provide a skewed picture of the health of GWE veterans; specifically, such studies capture only the experiences of the most severely ill soldiers, and, because certain conditions common among veterans are more likely to be seen on an outpatient basis, hospitalization data for some types of conditions prevalent among GWE veterans will provide only a very limited view of the total morbidity experienced by GWE veterans and may tend to overemphasize the importance of psychiatric morbidity while undervaluing the role of musculoskeletal morbidity.
- Determined that external events, such as media coverage of efforts to downsize the military and realign bases, occurred at around the same time as certain peaks in the hospitalization rates of many conditions commonly reported by GWE veterans. Because these events seem likely to be stressful for active duty soldiers it makes it extremely difficult to parse out the influence of war-related experiences from these external events on the health and well-being of GWE veterans.
- Discovered evidence of a healthy warrior effect among GWE veterans, in that even though the percentage of soldiers who seek care from the VA Persian Gulf Registry after the war without having registered with the CCEP is small, there are large numbers of soldiers who ultimately seek care for Gulf War deployment related health concerns in the Veteran's Administration system but who did not register with the CCEP while on active duty.
- Demonstrated the strengths and limitations of using a large linked database comprising administrative data sources in Force Health Protection Research. Developing a technical report that reviews the data management issues and hazards that must be borne in mind when interpreting results from data sources such as the TAIHOD. Made recommendations for improvements in collection of administrative data that will yield data of sufficient quality to aid Force Health Protection Research.

8. Reportable Outcomes

Published Papers, Manuscripts Under Review, and Technical Reports

- Bell NS, Amoroso PJ, Williams JO, Yore MM, Engel CC, Senier L, DeMattos AC, Wegman DH. Demographic, physical, and mental health factors associated with deployment of U.S. Army soldiers to the Persian Gulf. Mil Med 2000;165(10):762-72.
- Bell NS, Amoroso PJ, Wegman DH, Senier L. Commentary: Proposed explanations for excess injury among veterans of the Persian Gulf War and a call for greater attention from policy-makers and researchers. Inj Prev 2001;7(1):4-7.
- Bell NS, Amoroso PJ, Wegman DH, Senier L. Why are people who return from war at increased risk of injury? West J Med 2001;175(2):115-118.
- Bell NS, Senier L, Yore MM, Engel CC, Wegman DH, DeMattos AC, Williams JO, Amoroso PJ. A three-decade view of hospitalization rates for conditions common among Army soldiers deployed to the Gulf War: interpretation and sources of bias. Am J Epidemiol, Under review.
- Senier L, Bell NS, Schempp C, Amoroso PJ. The U.S. Army's Health Risk Appraisal (HRA) Survey, Part I: History, Reliability, and Validity. Technical Note. Natick, MA: U.S. Army Research Institute of Environmental Medicine, Under review.
- Bell NS, Williams JO, Senier LS, Amoroso PJ. The U.S. Army's Health Risk Appraisal (HRA) Survey, Part II: Generalizability, Sample Selection, and Respondent Profile. Technical Note. Natick, MA: U.S. Army Research Institute of Environmental Medicine, Under review.
- Bell NS, Amoroso PJ, Senier L, Williams JO, Yore MM, Schneider GA. The Total Army Injury and Health Outcomes Database (TAIHOD): Uses and Limitations as a Research Tool for Force Health Protection Research. Technical Note. Natick, MA: U.S. Army Research Institute of Environmental Medicine. Draft

Progress Toward Academic Degrees

Two students have been directly supported on a part-time basis by funds from this grant.

- Mr. Jeffrey Williams is working towards completion of his master of science degree in epidemiology at University of Massachusetts Amherst.
- Ms. Laura Senier completed her master of public health degree from Boston University in May 2000.

Other Education and Training Programs

Four members of our team have taken courses through the Epidemiology Research Institute (ERI) summer program:

- Epidemiologic data analysis
- Survival analysis in epidemiology
- Regression modeling in epidemiology

Three members of our team have received special training in innovative database management techniques and data presentation approaches.

- Dr. Amoroso and Mr. Williams attended a course run by SAS Institute (Cary, NC) entitled, "SAS Enterprise Miner: Applying Data Mining Techniques." This course has aided the research team in designing a data warehouse to use in researching the relationship between life stressors,

demographic characteristics, and deployment information and the development of a Gulf War Illness.

- Dr. Amoroso and Mr. Williams attended a course run by SAS Institute (Cary, NC) entitled, "Building a Data Warehouse Using SAS Warehouse Administrator Software." This course has aided the research team in understanding and applying data mining techniques to apply in researching the relationship between life stressors, demographic, and deployment information and the development of a Gulf War Illness.
- Ms. Senier and Mr. Williams attended Edward Tufte's one-day course in Presenting Data and Information in Boston, Massachusetts. This course has aided the research team in designing clear and easily interpreted figures to display the combinations of trends in hospitalization rates and other simultaneously occurring events in the research period under study.

9. Conclusions

- HRA data need to be carefully evaluated and validated before researchers can rely on them. We encourage anyone who acquires these data or intends to use them from a source other than the TAIHOD to refer to the HRA reports developed under this grant for advice on how best to proceed.
- Relying upon hospitalizations as an indicator of deployment related illness is likely to miss cases for some types of conditions and present a skewed picture of the health of deployed soldiers. For example, musculoskeletal conditions may be particularly likely to only receive care in an ambulatory setting. On the other hand, mental disorders may be more likely to be captured in hospitalization data.
- Prior studies relying on hospitalizations, particularly where trends are noted, should be interpreted with caution as there are were several administrative practices and coding changes that affected hospitalization rates over time. Researchers interested in evaluating temporal trends in hospitalizations should refer to our published manuscript on trends in GWI for information regarding potential pitfalls and challenges.
- Managers of large military databases, such as the CCEP, should be given more explicit instructions about the importance of maintaining complete records. There should be more involvement of data users (researchers, policy makers, medical care providers) in the construction and maintenance of these systems.
- Resources should be devoted immediately to the evaluation of the Gulf War activation records. This crucial piece of information about possible exposure needs to be better understood both because of its widespread use in studies already completed and to avoid repeating mistakes in future deployment-tracking efforts.
- Stressors in a soldier's personal life or on the job increase risk for illness hospitalizations. These experiences may interact with war-related or deployment-related stressors to further exacerbate risk for a GWI. The relationship between occupational factors (e.g., tenure in position, match between job one is trained for versus job one is performing), deployment, and health outcomes deserve further inquiry.
- Injury persists as the only documented source of excess mortality among Gulf War veterans. Excess injuries were also documented among U.S. and Australian Vietnam veterans. More research is needed to clarify the link between deployment and injury; to document a link and to clarify which of the potential causal pathways is/are operating to increase risk; and to identify important risk factors or modifying factors that might reduce injury risk or adverse sequelae.
- Prewar deployers appear healthier, happier, and under less stress than their nondeployed peers. On the other hand, they engage in behaviors likely to increase their risk for injury and experienced significantly more injury-related hospitalizations in the prewar period than their nondeployed peers suggesting they may be inherently greater risk takers or exposed to greater injury risks (occupation or personal lives). This excess risk may persist throughout the war and explain, in part, the excess injury mortality rates documented among redeployed Gulf War veterans.
- The TAIHOD is a useful tool for the study of deployment and health and in particular is well suited for the study of injury outcomes associated with deployments. It should be particularly useful for more recent deployments as more data have been added that would allow for even more comprehensive evaluations of various risk factors and health outcomes.

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11. Appendixes

Appendix A

Bell NS, Senier L, Yore MM, Engel CC, Wegman DH, DeMattos AC, Williams JO, Amoroso PJ. A three-decade view of hospitalization rates for conditions common among Army soldiers deployed to the Gulf War: interpretation and sources of bias. Am J Epidemiol, Under review.

NOTE: This manuscript is under review at a peer-reviewed journal. Please do not cite, reproduce, or disseminate.

A three-decade view of hospitalization rates for conditions common among soldiers deployed to the Gulf War: interpretation and bias

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Footnotes page

Abbreviations used in the text:

dGWE	deployed Gulf War Era
DMDC	Defense Manpower Data Center
GWE	Gulf War Era
ICD	International Classification of Diseases
ICGW	Illnesses of Concern after the Gulf War
ODS/DS	Operations Desert Shield/Desert Storm
PASBA	Patient Administration Systems and Biostatistical Activities
TAIHOD	Total Army Injury and Health Outcomes Database

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Running head: Trends in Gulf War Illnesses

ABSTRACT

Since the Gulf War, researchers have taken advantage of electronic hospitalization data to estimate the health impact of military deployments. The authors evaluated hospitalization data as a measure of health with specific attention to Illnesses of Concern after the Gulf War (ICGW). Using the Total Army Injury and Health Outcomes Database (TAIHOD), the authors charted hospitalization trends for ICGW over a 30-year interval. Four types of possible bias were demonstrated: 1) changes in diagnosis, health care delivery, and coding practices; 2) healthy worker effect bias (greater attrition among war veterans and VA healthcare-seeking for war-related health concerns not reported during active duty service; 3) instrumentation bias (variable sensitivity of hospitalization for different diagnoses); and 4) historical bias (possible associations between hospitalizations and media coverage of ICGW and military downsizing). Hospitalization data have inherent limitations and biases, and should be used cautiously and in combination with other data sources including surveys, mortality data, ambulatory care data, and personnel data.

MeSH subject headings: Gulf War, epidemiology, cohort studies, hospitalization, military personnel, Army, bias

The United States deployed nearly 700,000 soldiers to Operations Desert Shield/Desert Storm (ODS/DS) (1). Soon after these soldiers returned to the United States, reports of unexplained illnesses began to surface. Many soldiers attributed their illnesses to service in the Gulf (2). Veterans of conflicts dating back to the American Civil War have similarly complained of symptoms and ill-defined health conditions subsequent to wartime service, and it has been suggested that it is not deployment to the Persian Gulf *per se* that is causing the health problems of Gulf War veterans but perhaps these conditions are a generic consequence of participation in war (3). Moreover, many of the ill-defined, symptom-based conditions reported by deployed Gulf War Era (dGWE) veterans are commonly found in many primary care populations (4).

There is still no consensus regarding an appropriate case definition for Illnesses of Concern after the Gulf War (ICGW) and limited data are available to link putative risk exposures to unique individuals and specific health outcomes. Hospitalization data are available electronically, contain information on the entire active duty soldier population, and have relatively little missing information. They often provide the only available morbidity information available for population-based studies of ICGW. However, hospitalization data have inherent limitations and may be biased in ways that make their use in the study of ICGW challenging and potentially misleading. To date these potential biases have not been systematically addressed in the medical literature on veterans' health.

This paper plots hospitalization rates for conditions commonly diagnosed among GWE veterans from 1971 through 1998. Changes in rates over time may suggest

etiologies for conditions prevalent among veterans of military conflicts and clarify how much of the morbidity experienced by veterans is explainable as the "background rate" of illness. These analyses also demonstrate at least four potential limitations of hospitalization data in describing the health experiences of GWE veterans. These biases affect our ability to precisely estimate the added burden of illness among dGWE veterans that is attributable to wartime experiences.

Potential limitations to hospitalization data

1. Changes in hospitalization coding practices. Over the past 30 years, cost containment pressures have resulted in a system of managed care that favors treating patients on an outpatient basis in order to avoid costly hospitalizations. There have also been systematic changes in the International Classification of Diseases (ICD) system for coding illnesses and injuries. The Army used ICDA8 from 1971 to 1979 then, ICD-9 from 1980 to 1985, and then switched to ICD-9-CM in 1986/1987. Coding changes result from changes in medical practices, diagnostic behaviors, and technologies that improve the ability to clinically discern previously unrecognized pathologies.

2. Healthy worker bias. Studies focusing only on veterans who remain on active duty are susceptible to healthy worker bias, resulting in an underestimate of the true magnitude of war-related morbidity and mortality. Because health records for soldiers on active duty are maintained separately from those who have been discharged and are seeking care through the VA or civilian healthcare plans, most studies to date capture only the experiences of selected samples of veterans who may be healthier (those still

on active duty) (5, 6) or less healthy (those who have left the military) (7). No medical dataset in existence captures the health experiences of all dGWE veterans. For example, many veterans, once they leave the service, never receive medical care from the VA. Those who are eligible for care in the VA are either medically disabled or indigent, or both.

3. Instrumentation bias. While there is still no consensus regarding how ICGW should be defined, attention has focused on veterans experiencing one or more of many chronic, symptom-based conditions reported during or after deployment (8-13). Hospitalization databases are not designed to capture information on symptoms, and researchers have often relied instead on proxy measures (e.g., defining "cases" as hospitalizations for an ICD-9-CM coded ill-defined condition).

Moreover, hospitalization is an unbiased indicator of health status only if it represents a threshold of illness severity that is constant across the different risk groups one is comparing. If the threshold varies across groups, then comparisons may be misleading. After the Gulf War there was a heightened sensitivity to the health of deployed soldiers, which may have resulted in a lower threshold of illness severity required to hospitalize deployed soldiers than their nondeployed GWE peers (14). Similarly problematic is the possibility that certain conditions may be more likely to result in hospitalization based on a soldier's deployment status (e.g., deployed vs. nondeployed), branch of service (e.g., Army vs. Navy), or duty status (e.g., active duty, Guard, or Reserve).

Administrative responses to veterans' concerns may influence healthcare seeking and thus impact hospitalization rates. The VA instituted a registry for Gulf War veterans with health concerns in the autumn of 1992 to evaluate the health of dGWE veterans who were no longer on active duty (7). In 1994 the DoD implemented the Comprehensive Clinical Evaluation Program (CCEP) registry for concerned soldiers still on active duty (15). The extensive evaluations required under the CCEP may have caused some referral centers to hospitalize dGWE veterans for logistical reasons rather than medical necessity, resulting in artificially inflated hospitalization rates. Furthermore, awareness of these health registries may have caused dGWE veterans suffering from conditions *not* related to deployment to attribute their symptoms to the war (16).

Finally, the symptom-based conditions that plague many dGWE veterans are often treated in outpatient settings. Outpatient data from military medical treatment facilities are not available in electronic format before 1997. If the cases that resulted in hospitalization were only those that were most severe, then using hospitalizations alone as a proxy measure for all such conditions might result in valid comparisons of the condition-specific morbidity among GWE veterans. If, however, some conditions were more likely to result in hospitalization regardless of severity, then the resulting picture of morbidity might be skewed towards these conditions.

4. Historical bias. A number of events, external to ODS/DS, may have influenced health care utilization by GWE veterans. First, immediately after the war ended, the media focused intently on the health status of returning veterans. Speculation about the possible existence of a "Gulf War Syndrome" caused confusion

and perhaps compounded the stressors of war. An analysis of soldiers enrolling in one of the veterans' health registries found that the number of people calling the toll-free information line corresponded very closely to media coverage of "mysterious illnesses" among GWE veterans (17). The role of publicity in affecting healthcare-seeking behaviors has been demonstrated in screening for cancer or HIV after celebrity testimonials of experiences with these diseases (18-26).

Second, in March 1991, U.S. soldiers destroyed a cache of Iraqi rockets at Khamisiyah that contained chemical warfare agents. In October 1993, the DoD sent letters to approximately 20,000 soldiers notifying them that they might have been exposed to nerve agents and encouraging them to seek medical evaluation if they were experiencing any health problems (B. Rostker, Office of the Secretary of Defense, Special Assistant for Gulf War Illnesses, written communication, June 2000). In July 1997, an additional 97,837 letters were sent notifying individuals that they also may have been exposed to "trace levels" of nerve agent. Each disclosure received widespread media coverage and may have influenced physicians' medical practices and GWE veterans' health seeking behaviors.

It is also possible that military matters unrelated to the war may have influenced rates of illnesses among soldiers. Military downsizing throughout the 1990s may have increased risk of stress-related conditions among soldiers. Civilian studies have linked downsizing with elevated rates of illness even among those who retain jobs, perhaps due to increased workloads (27-37). This increased stress may have affected dGWE soldiers and their nondeployed peers equally, but it is possible that the combined

influence of deployment and downsizing may have had a synergistic adverse impact on the health of dGWE veterans.

The objective of this study was to document trends in ICGW over time and to review potential biases that must be considered when interpreting hospitalization data.

MATERIALS AND METHODS

The data

The Total Army Injury and Health Outcomes Database (TAIHOD)(38, 39) was used to document trends in ICGW among Army soldiers from 1971 to 1998, and to explore potential sources of bias in hospitalization data for the study of GWE veterans. The TAIHOD links several DoD administrative and health databases including personnel records from the Defense Manpower Data Center (DMDC) (e.g., demographic data, Gulf War deployment status); hospitalization data from the Patient Administration Systems and Biostatistics Activities (PASBA) (cause and nature of a condition); ambulatory care records from PASBA for the year 1998, and data from the CCEP (including diagnostic results of clinical evaluations).

Analytic approach

To analyze potential deployment-related illnesses we identified the 25 most common diagnoses (excluding healthy) among CCEP registrants. Because there is no agreed-upon definition for ICGW, we refer to these as "CCEP25 disorders" throughout the rest of the paper. Semiannual hospitalization rates were calculated from 1971 to 1998, using the total number of soldiers on active duty in each 6-month time period as

the denominator. Hospitalization rates for each of the CCEP25 disorders were plotted for all active duty Army personnel and for each gender using only primary diagnoses to identify cases.

To control for changes between versions of the ICD, an expert nosologist derived equivalent codes across the three different versions of the ICD in use during the study period. We also plotted rates for appendicitis (ICD codes 540-543.99) as an example of a well-defined clinical condition whose code did not change over the study period. Appendicitis is typically severe enough to result in at least a one-day hospital stay, and therefore should be less susceptible to the cost-containment pressures that have shifted some inpatient care to outpatient settings.

To evaluate the potential influence of healthy worker bias we first defined the GWE study cohort as soldiers who were on active duty during the entire period encompassing ODS/DS (i.e., June 1990, December 1990, and June 1991; N=675,626). We excluded soldiers not on active duty for any portion of time during this period to ensure that comparisons involved individuals uniformly at risk of deployment (6). Deployed status was defined as presence in the theater of operations at any time between August 1990 and June 1991. We followed deployed and nondeployed soldiers from June 1991 to December 1998 to assess rates of retention in the Army. Second, we linked DoD active duty Army data with VA Persian Gulf Registry data. We identified all soldiers who were on active duty in the Army at *any* time between June 1990, and June 1991 (N=836,363) and categorized them based on whether or not they registered with the Army's CCEP while on active duty (32,754 had registered with CCEP and 803,609 had not). Those who had registered with the CCEP were stratified

into two groups based on whether they had received a diagnosis other than healthy during their CCEP evaluation (22,054 CCEP registrants were given a diagnosis other than healthy). VA researchers identified soldiers from each of our assigned groups who registered with the VA registry after leaving the Army. They then documented the proportion of soldiers within each group who reported experiencing symptoms and who received a diagnosis other than healthy.

To assess the potential for bias posed by using inpatient hospitalizations alone, we examined hospitalizations and outpatient visits resulting in a CCEP25 disorder in calendar year 1998 for all soldiers on active duty in 1998 with a primary diagnosis of any of the CCEP 25 disorders. The likelihood that care-seeking for a given CCEP25 disorder resulted in hospitalization, as opposed to being treated in an outpatient setting only, was determined by comparing ratios of hospitalizations to outpatient visits.

To assess the influence of the CCEP on rates of ICGW hospitalizations, we charted hospitalization rates for CCEP25 disorders, stratified by deployment status and place of hospitalization (i.e., one of the 14 regional CCEP centers vs. other medical facilities). If the CCEP influenced hospitalization rates, we might expect deployed soldiers to have higher rates of hospitalizations for CCEP25 disorders in the CCEP facilities than their nondeployed counterparts, and lower, or similar, hospitalization rates for these conditions in other medical facilities.

To investigate the influence of external events on rates of illnesses we first overlaid major DoD administrative actions related to ODS/DS onto the graph of rates of hospitalizations for CCEP25 disorders for June 1990-December 1998. Second, we

mapped media coverage of military downsizing, and "mysterious illnesses" among GWE veterans, by counting the number of newspaper articles concerning each topic. The number of newspaper articles would presumably illustrate both the magnitude of importance placed on an issue and exposure of military personnel to information that may sensitize them to their health status. We searched Lexis-Nexis®, which includes all major U.S. newspapers (list of papers available upon request), and reviewed the full text of all articles identified by our search. To search for articles addressing ICGW, we searched for combinations of the terms "Gulf War" AND "illness OR syndrome OR sick OR injury" from the period June 1991 through December 1998. To identify articles concerning military downsizing, we searched on combinations of the terms "base AND military" AND "closing OR closure" from the period June 1985, through December 1998. Trained reviewers conducted reviews and two research associates repeated samples of reviews in order to assess reliability of coding.

Analyses were conducted in SAS version 8.0 (SAS Institute, Cary, NC) or Microsoft Excel (Microsoft Corporation, Redmond, WA). The analyses conducted for this paper adhere to the policies for protection of human subjects as prescribed in Army Regulation 70-25 and with the provisions of 45 CFR 46.

RESULTS

Table 1 describes the CCEP25 disorders (grouped by their major ICD categories) and shows the correspondence between the three ICD versions in use during the study period. Twenty-four percent (24%) of the conditions are mental disorders and 32% are diseases of the musculoskeletal system and connective tissue. Though six different

diagnostic codes appear in the musculoskeletal system and connective tissue-related category, 72% of cases had primary diagnoses of lumbago.

INSERT TABLE 1 HERE

1. Changes in hospital coding practices. Figure 1 shows hospitalization rates for CCEP25 disorders and appendicitis among all active duty Army soldiers for 1971-1998. Appendicitis hospitalization rates remained stable across the entire time period. Hospitalizations for CCEP25 disorders have declined over time from 658/100,000 in 1971 to 176/100,000 in 1998. Rates among women are consistently twice as high as among men. While rates overall appear to have declined, there were notable peaks in the early 1970s and a smaller peak just after the Gulf War in 1991. There were also several smaller increases in rates, generally preceding each change in ICD coding versions.

INSERT FIGURE 1 HERE

2. Healthy worker bias. On average, beginning in December 1992, 2% more dGWE veterans left the military each year than nondeployed GWE veterans, with the greatest difference in rate of discharge, 3.8%, occurring in 1994. The health status of these discharged veterans is not known. However, results from our pilot linkage study indicate that 3.4% of the 803,609 discharged Army soldiers who did not seek evaluation under the Army's CCEP program sought care through the VA's Persian Gulf Registry (N=27,215), and that the majority of these individuals (76%) received a diagnosis other than healthy (data available upon request).

3. Instrumentation bias. Figure 2 shows inpatient hospitalizations and outpatient visits in 1998 that resulted in a CCEP25 disorder diagnosis. Outpatient visits exceed hospitalizations for all diagnoses so results are shown on a log scale (bars for individual diagnoses are labeled with the actual counts of inpatient hospitalizations and outpatient visits). The overall ratio of inpatient stays to outpatient visits is 1:276. The ratio of inpatient stays to outpatient visits for specific diagnoses and across diagnostic categories varies from the overall ratio of inpatient to outpatient stays (as indicated by the location of the diamond-shaped symbol). Conditions such as rash, malaise and fatigue, and lumbago have thousands more outpatient visits than inpatient visits while the ratio of outpatient to inpatient visits for sleep apnea is 24:1. Mental disorders and nervous system disorders appear relatively more likely to result in inpatient hospitalizations, while musculoskeletal disorders were more likely to be treated on an outpatient basis. Three of the top five inpatient primary diagnoses were for some form of depression while the top three outpatient diagnoses were related to back or joint pain.

INSERT FIGURE 2 HERE

4. Historical bias. Figure 3 shows rates for inpatient hospitalizations for CCEP25 disorders, stratified by deployment status and type of medical facility. Rates of admissions are lower overall in the CCEP facilities. There is a peak in rates between June 1994-1995 in both CCEP facilities and other military medical facilities, about the time the CCEP program was initiated. Though the increased rates in 1994 were most pronounced among dGWE veterans, nondeployed GWE veterans also experienced increases in admissions for CCEP25 disorders during this time period.

Boxes below the figure show dates of administrative events related to the Army's response to the health concerns of GWE veterans. The most noticeable peak in hospitalization rates occurred just after the CCEP was established. There was a smaller peak among deployed soldiers who sought care in a CCEP facility around the time the news media reported the Khamisiyah event.

INSERT FIGURE 3 HERE

Figure 4 shows hospitalization rates for CCEP25 disorders among dGWE and nondeployed GWE veterans from 1985 through 1998. Stacked bars reflect media coverage of ICGW and military downsizing. Increases in hospitalizations for both deployed and nondeployed GWE veterans began occurring with the Iraqi invasion of Kuwait in August 1990, and continued to increase until the last troops participating in the ground war returned home in June 1991. Two large peaks in hospitalization rates appear noteworthy, one in 1991, when troops were returning from the conflict, and the other at the end of 1994, just after the CCEP registry was initiated. While the peaks were most notable for the dGWE veterans, there were smaller increases in hospitalization rates among nondeployed GWE veterans that followed a similar distribution. The peak occurring between June 1994, and June 1996, immediately followed a sharp increase in media coverage of ICGW. Though the pattern is less clear than for media coverage of ICGW, the two largest peaks in hospitalizations coincided with increases in media coverage of military downsizing.

INSERT FIGURE 4 HERE

DISCUSSION

Figure 1 provides the first long-range hospitalization data on rates for conditions common among dGWE veterans. We found evidence that symptom-based illnesses such as those occurring among Gulf War veterans may also have occurred after Vietnam service. That peaks in rates occurred after both conflicts suggests that the peak is not attributable to the CCEP alone, since there was no such Army program after Vietnam. The higher rates found in the early 1970s, when many deployed Vietnam veterans were returning, suggests that some of these illnesses may be related to war exposures in general rather than to deployment to the Gulf region specifically. However, relatively few women were deployed to Vietnam and the increased rate of illness among women is, therefore, less easily attributed to deployment. Moreover, the number of military deployments increased dramatically throughout the 1990s, and there was no obvious corresponding increase in CCEP25 disorders. It may be that no increase occurred, the size or duration of recent deployments was too small to have had a meaningful impact on population rates, or that hospitalizations are an insensitive indicator of the health problems associated with those deployments.

Our review of nearly 30 years of hospitalization data suggests there are important threats to the validity of research using hospitalization data alone to evaluate the longitudinal health of military personnel after deployment.

First, we found evidence of temporal changes in diagnostic, health care delivery, and coding practices. Rates of inpatient diagnoses changed over time and there was a shift in the main locus of care from inpatient to outpatient settings.

Second, we found evidence suggesting the potential for historical bias. External factors such as media coverage of ICGW and military downsizing were temporally related to increases in hospitalization for ICGW. While peaks in rates for CCEP25 disorders were most notable among the deployed soldiers, there were also smaller increases in rates among the nondeployed soldiers that roughly followed the same distribution as the deployed soldiers' rates for hospitalization. This suggests that a common etiology, not related to deployment, could explain some of the excess hospitalizations among all GWE veterans. It is difficult to separate the effects of deployment *per se* from the influences of media coverage, government notification of possible hazardous exposures, and external stressful events such as downsizing when evaluating risk for deployment-related conditions among GWE veterans.

Third, we noted instrumentation bias. Utilization ratios of hospitalizations to ambulatory care visits varied markedly across different conditions. Use of hospitalization data alone to quantify symptom-based illnesses undercounts all conditions, and does so in different proportions for individual diagnoses and broad diagnostic categories. Hospitalization data better discerns increases in some conditions (e.g., psychiatric disorders) while virtually overlooking others (e.g. musculoskeletal conditions).

Finally, we found evidence suggesting the possibility of healthy worker bias. Attrition was higher among dGWE veterans than nondeployed GWE veterans, and many individuals sought care for Gulf War-related health concerns in the VA after they left the military although they had not sought care for those conditions while in the military. While the percentage of dGWE veterans who did not register with the CCEP

while on active duty but who did register with the VA registry after leaving the Army was small, the absolute number of individuals was large (N=27,215), and three-fourths of them were symptomatic.

There are limitations to our results. The association between media coverage and hospitalizations may suffer from ecological fallacy. We do not know if the soldiers who were hospitalized were the same ones reading the media articles or receiving the letters regarding the Khamisiyah explosion. In addition, our analysis of media events included only raw counts of newspaper articles on various topics, and did not consider circulation, placement, headline size, illustration, or other factors that might bring articles to the reader's attention. Our efforts to identify codes in prior editions of the ICD may have introduced some misclassification, especially when some conditions were grouped or ungrouped in different versions of the ICD, or when codes were introduced for "new" conditions. For example, post-traumatic stress disorder had no formal code or definition prior to ICD9. The exclusion of this condition from the combined list of CCEP25 disorders may have biased the overall hospitalization rates downward in the early years (1971-1980). Other conditions with unique codes under ICD9 were grouped with other codes under ICD8, possibly resulting in an upward bias in rates for earlier years. While we tried to account for coding changes it is most conservative to make comparisons within time periods that are covered by the same coding system. We can conclude that overall rates were declining over time by examining downward trends that occurred during each of the 3 intervals covered by the different codebooks, but an absolute comparison between rates in 1970 and 1998 would be inadvisable. Finally, our presentation of data is subject to the very biases we discuss in this paper. It was

not our intent to measure precisely the extent of each source of bias. Rather, we intend to demonstrate the salience of these biases when interpreting analyses using hospitalization data.

Hospitalization data remain an important source of data in estimating the effect of deployment on veterans' health, despite their limitations. They are easily accessible, available for the entire population of military personnel, and may be linked to other health data sources (38-40). Our work shows, however, that hospitalization data are best used in combination with other sources of data on health status and overall functioning, such as ambulatory care and laboratory data, death certificates, survey data, and personnel records. This information may be useful in guiding planning for future studies of health outcomes among deployed military personnel.

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TABLES AND FIGURES

Table 1. Twenty-five conditions other than healthy most commonly reported by active-duty Army soldiers registering with the Comprehensive Clinical Evaluation Program (CCEP), with their ICD-9-CM codes and corresponding codes from the ICD-9 and ICDA8 codebooks

ICD-9-CM	% of Diagnoses	ICD-9-CM DEFINITION	ICD-9	ICDA8
290-319		**Mental Disorders**		
296.20	8.5%	Major Depressive Disorder, Unspecified	296.1	296.0, 296.2
300.4	4.4%	Neurotic Depression	300.4	300.0, 300.4
307.81	1.9%	Tension Headache	307.8	306.8
309.81	1.9%	Prolonged Posttraumatic stress disorder	N/A	N/A
311	7.4%	Depressive Disorder, Not elsewhere classified	311	790.2
320-389		**Diseases of the Nervous System & Sense Organs**		
346.90	2.0%	Migraine, Unspecified	346.9	346
390-459		**Diseases of the Circulatory System**		
401.9	5.6%	Essential Hypertension, Unspecified	401.9	401
460-519		**Diseases of the Respiratory System**		
477.9	0.5%	Allergic rhinitis, cause unspecified	477.9	507

ICD-9-CM	% of Diagnoses	ICD-9-CM DEFINITION	ICD-9	ICDA8
493.90	16.5%	Asthma, Unspecified, without mention of status asthmaticus	493.90	305.2, 490, 493
520-579		**Diseases of the Digestive System**		
530.81	3.3%	Esophageal Reflux	530.0, 530.1	530.9
564.1	2.9%	Irritable colon	564.1	305.5, 564.1
680-709		**Diseases of the Skin and Subcutaneous Tissue**		
692.9	1.5%	Contact Dermatitis and other Ecze, Unspecified cause	692.9	692.9
710-739		**Diseaes of the Musculoskeletal System and Connective Tissue**		
715.18	0.1%	Osteoarthritis, localized, other specified sites	715.18	N/A
715.90	0.5%	Osteoarthritis, unspecified, multiple sites	715.90	713.0, 723.9
719.40	0.2%	Pain in joint, site unspecified	719.40	787.3
719.46	7.9%	Pain in joint, lower leg	719.46	N/A
719.49	0.3%	Pain in joint, multiple sites	719.49	787.3
724.2	22.9%	Lumbago	724.2, 724.9	717.0, 717.9, 728.7
729.1	2.4%	Myalgia and myositis, unspecified	729.19	717.9, 733.9

ICD-9-CM	% of Diagnoses	ICD-9-CM DEFINITION	ICD-9	ICDA8
780-799		**Symptoms, Signs and Ill-Defined Conditions**		
780.52	0.2%	Other insomnia	780.5	306.4
780.57	1.2%	Other and unspecified sleep apnea	N/A	N/A
780.7	1.0%	Malaise and Fatigue	300.5, 780.7	300.5, 309.1, 790.1, 796.0
780.9	0.6%	Other general symptoms	300.9, 780.9	300.9, 780.7, 781.6, 788.9, 790.2
782.1	0.6%	Rash and other nonspecific skin eruption	782.1	788.2
784.0	6.0%	Headache	784.0	791

N/A=No prior code is Applicable

Figure 1. Hospitalization rates for CCEP25 disorders and appendicitis among all active-duty Army soldiers, 1971-1998

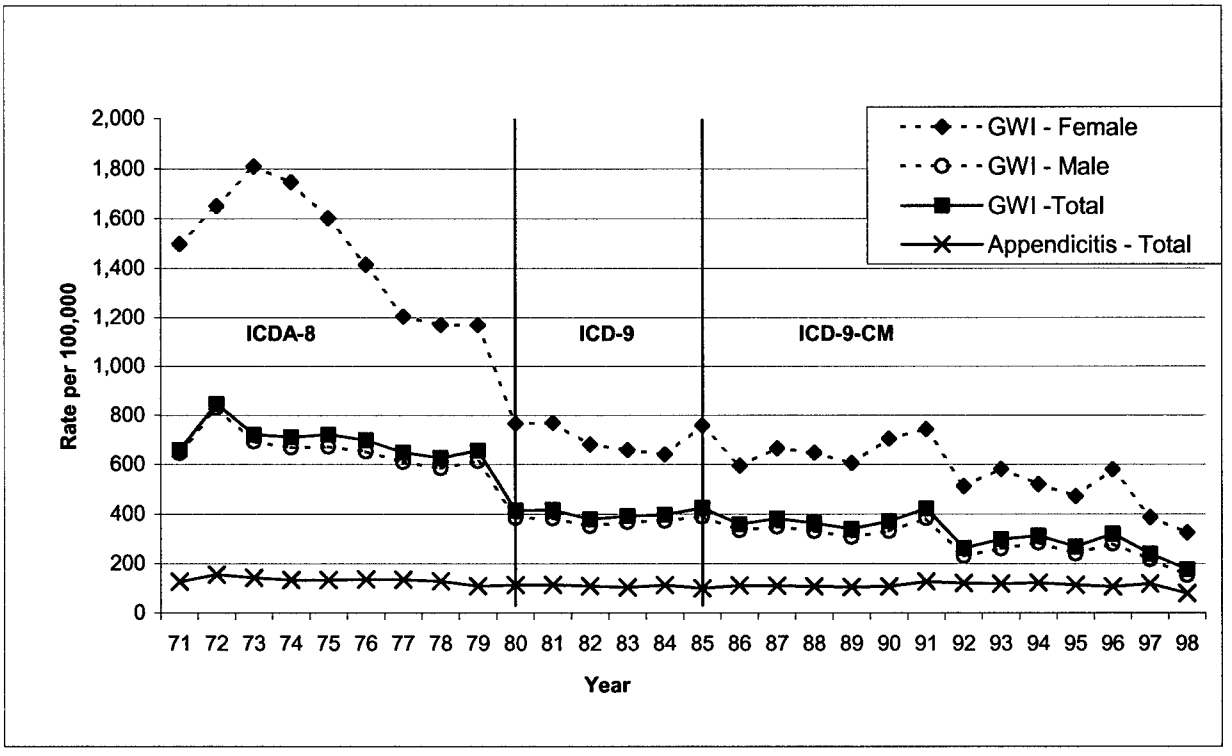


Figure 2. Number of inpatient hospitalizations and outpatient encounters for CCEP25 disorders, with ratio of outpatient to inpatient encounters, all active-duty Army soldiers, 1998

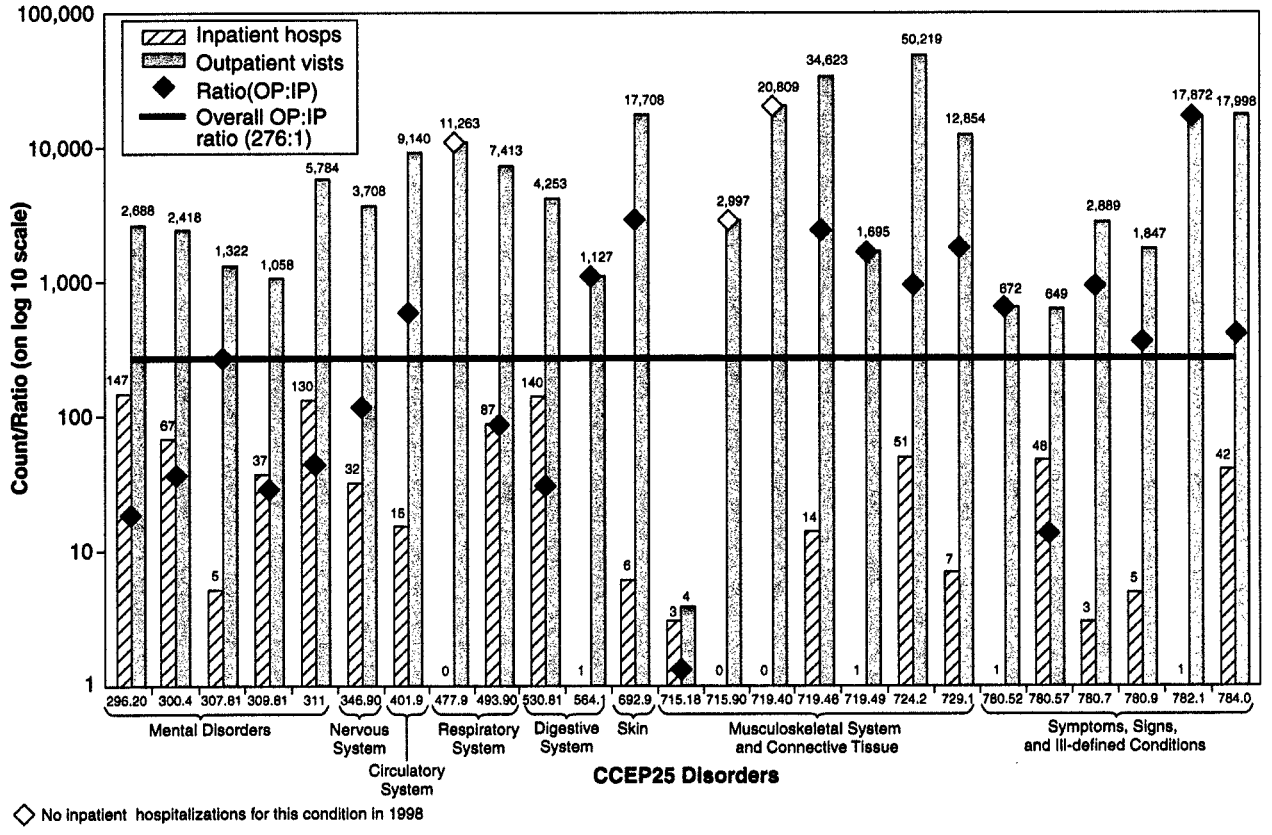


Figure 3. Rates of inpatient hospitalizations for CCEP25 disorders at regional CCEP centers and other military medical facilities, among deployed and nondeployed Gulf War Era veterans, and key dates pertaining to provision of medical care for Gulf War veterans, 1991-1998

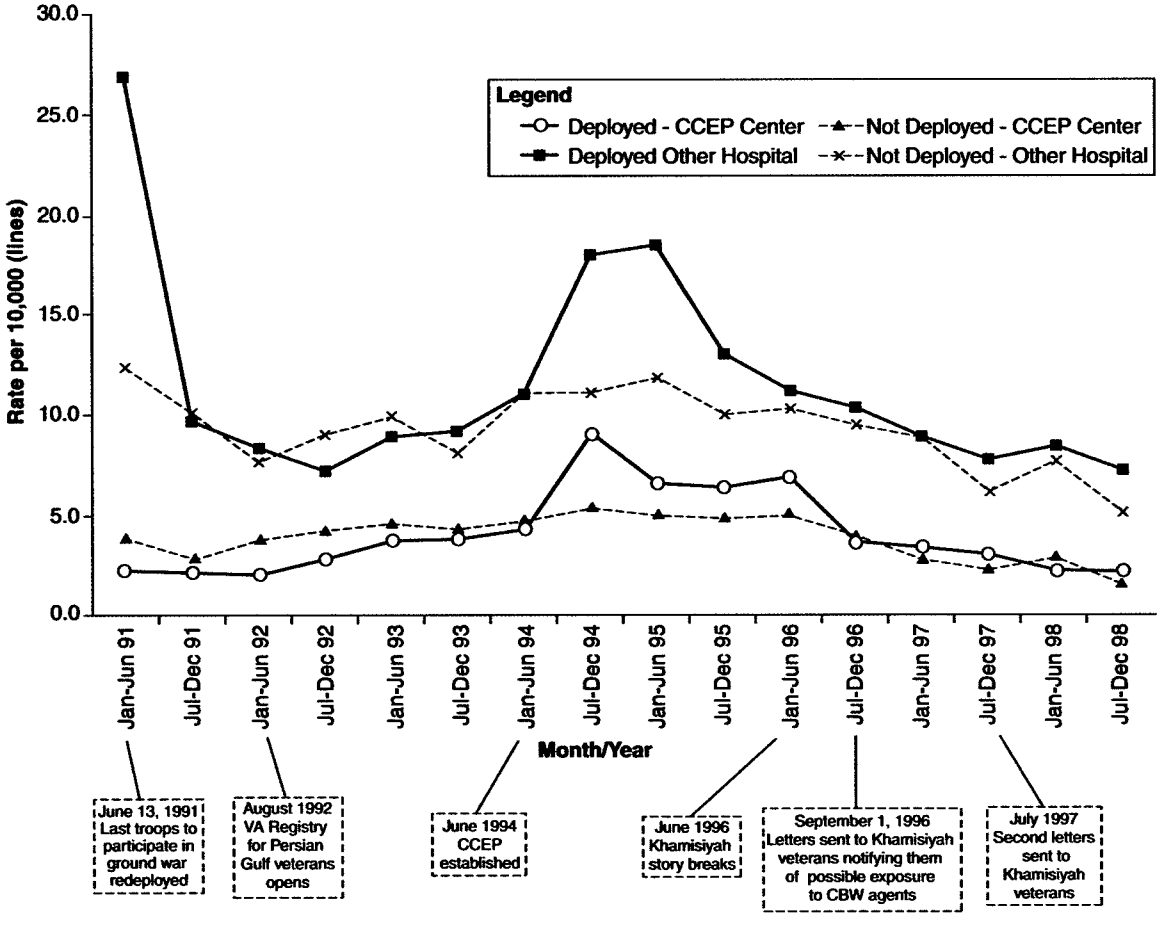
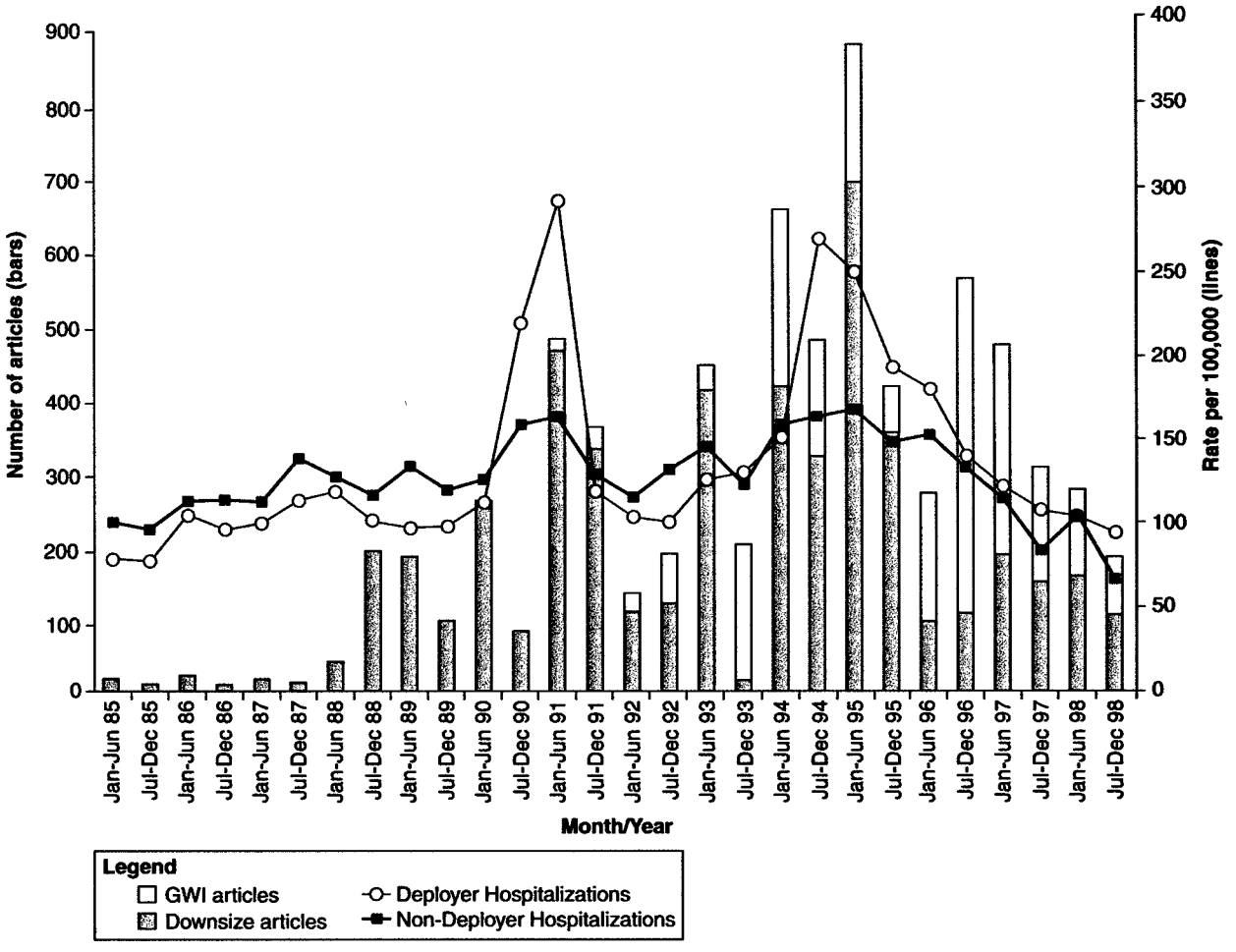


Figure 4. Rates of inpatient hospitalizations for CCEP25 disorders among deployed and nondeployed Gulf War Era veterans, with frequencies of newspaper articles concerning mysterious illnesses among Gulf War veterans and military downsizing, 1985-1998



Appendix B

Senier L, Bell NS, Schempp C, Amoroso PJ. The U.S. Army's Health Risk Appraisal (HRA) Survey, Part I: History, Reliability, and Validity. Technical Note. Natick, MA: U.S. Army Research Institute of Environmental Medicine, Under review.

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USARIEM Technical Note XX-XX

THE U.S. ARMY'S HEALTH RISK APPRAISAL (HRA) SURVEY PART I: HISTORY, RELIABILITY, AND VALIDITY

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ACKNOWLEDGMENTS

The authors would like to thank the following individuals for their assistance in preparing this technical report:

EXECUTIVE SUMMARY

Text

CHAPTER 1: DEVELOPMENT OF THE ARMY'S HEALTH RISK APPRAISAL QUESTIONNAIRE

The U.S. Army offered a Health Risk Appraisal (HRA) to its soldiers and their families from 1987 to 1998 as part of its Health Promotion Program. HRAs generally comprise three components: (1) measurement of risk factors for the individual based on life style habits, personal medical history, and family medical history; (2) use of the individual's risk factors to predict his or her risk of death (usually expressed as a risk of death within a specified time frame or as a "recalculated age"); and (3) feedback to the individual on ways to modify lifestyle behaviors to reduce the risk of disease, injury, and death [Beery, 1986 #37]. Although HRAs are designed as educational and diagnostic tools and not to gather information for research purposes, the Army's HRA has yielded an enormous database of self-reported information about health habits that is potentially useful in surveillance and research.

The purpose of this report is to document the history of the Army's HRA and to establish its utility as a tool for epidemiologic research. A companion report [Bell, #109] attempts to determine the generalizability of HRA survey responses and tests for sampling or response bias by describing the demographic characteristics of active-duty Army soldiers who took an HRA and comparing them to the Army at large.

This chapter briefly describes how the HRA functioned in the broader context of the Army's health promotion program and reviews the development of the Army's HRA questionnaire. Later chapters review what is known about the validity of the HRA risk assessment scores and the reliability and validity of the individual items.

THE HRA AS PART OF THE ARMY'S HEALTH PROMOTION PROGRAM

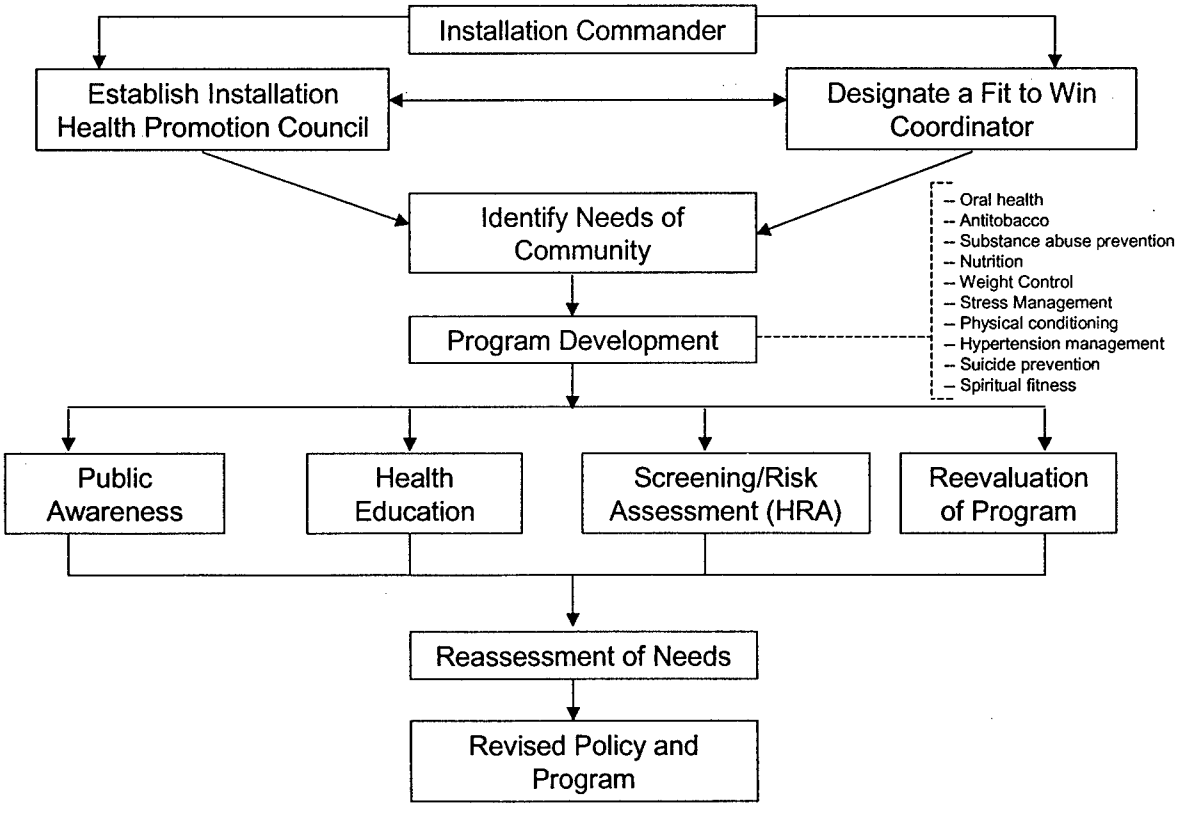
The Army's Health Promotion program was mandated by a Department of Defense (DoD) Directive, number 1010.10, issued on March 11, 1986, to take effect June 1, 1986 [Department of Defense, 1986 #34]. This Directive required all DoD agencies (i.e., all branches of military service, reserves, and defense agencies) to establish health promotion activities, and specifically called for health screening, health education on a variety of topics, and the creation of a healthy work environment (e.g., it superseded previous DoD requirements about smoke-free workplaces). This Directive targeted six priority areas of health promotion activity: smoking prevention and cessation, physical fitness, nutrition, stress management, alcohol and drug abuse, and early identification of hypertension. In implementing their individual programs, DoD agencies were allowed to address additional goals if they chose to do so, but the programs they put in place had to include components in these six core areas at a minimum.

In response to this requirement, the Army enacted AR 600-63 in November of 1987, outlining the specifics of the Army Health Promotion program [Department of the Army, 1987 #35]. This regulation placed responsibility for the Health Promotion program with the Deputy Chief of Staff of Personnel (DCSPER). According to AR 600-

63, the Army's health promotion program was designed to address ten specific areas of concern (tobacco control, physical conditioning, weight control, nutrition, stress management, alcohol and drug abuse prevention and control, early identification of hypertension, suicide prevention, spiritual fitness, and oral health). In addition, the regulation asserted that, "health promotion necessarily includes other related activities . . . such as physical and dental examinations, health risk appraisals, physical fitness facilities, recreation and leisure education and activities, as well as initiatives to promote social and emotional well-being [Department of the Army, 1987 #35]."

Figure 1 shows the development of an installation health promotion program, and how screening and health education were intended to function in such a program. In this model, responsibility for health promotion activities was shared by a "Fit-to-Win" coordinator and a health promotion council, under the supervision and ultimate authority of the installation commander. Aggregate data were to be provided to the installation commander to facilitate development of targeted interventions based on the needs of the local population. By allowing commanders to customize a health promotion program within their command, the program could be more responsive to the needs of the units or the individual soldiers. Figure 1 outlines a basic process of needs identification, program development and implementation, reevaluation, and revision as the means to establishing such a program.

Figure 1. Development of an Installation Health Promotion Program

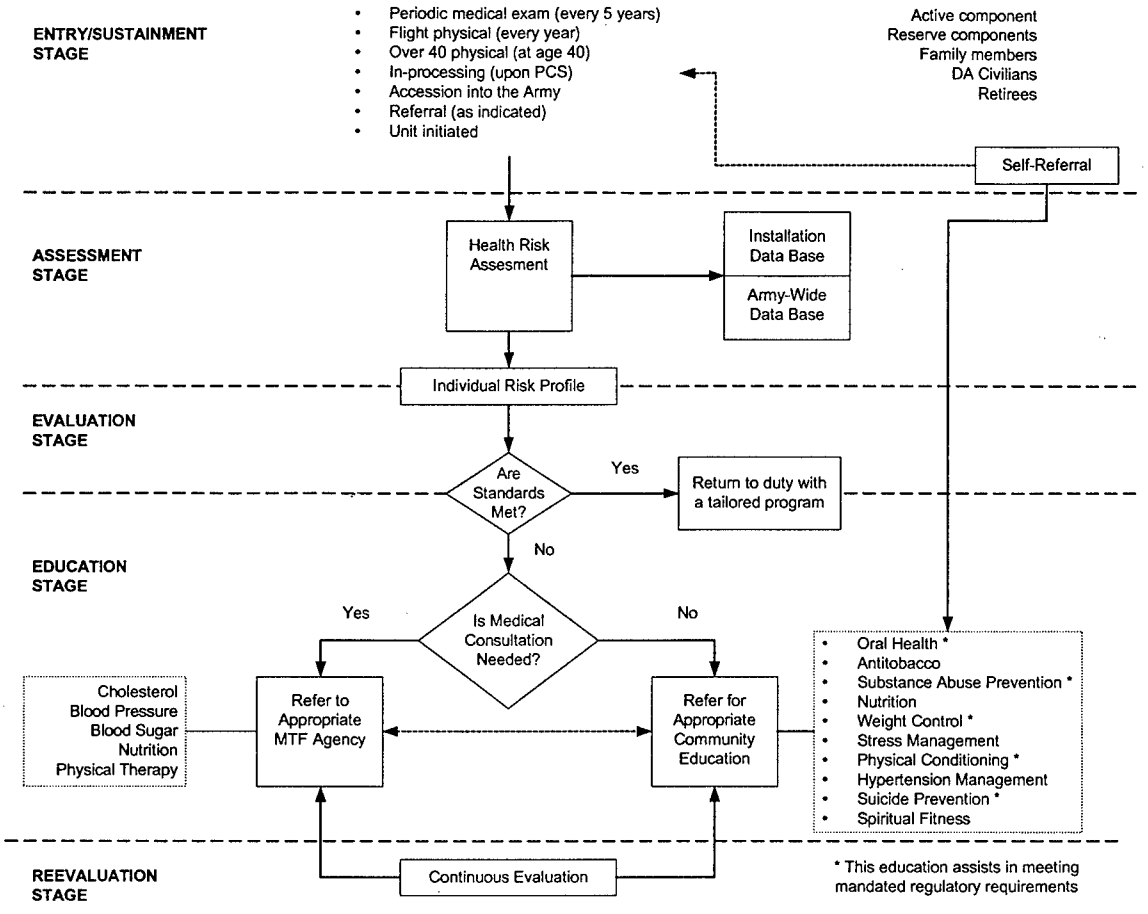


The Army's health promotion program was originally designed to include three types of screening and risk assessment tools: health risk appraisal, cardiovascular screening, and fitness evaluation. Only the HRA and the cardiovascular screening component elements were ultimately implemented. The data collected from these tools were to be used for program and resource planning, making comparisons about the health status of beneficiary groups, evaluating intervention programs, and assessing trends in health behaviors.

Figure 2 shows the health promotion process at the level of the individual. Eligibility extended to active duty and reserve soldiers, family members, civilian employees of the Army, and retirees. Entry into the health promotion process was triggered by accession into the Army, but also may have been warranted under other circumstances (e.g., periodic medical exams, annual flight physicals, inprocessing to a new assignment). Participants may also have self-referred into the process or have been directed to the program by someone in their chain of command.

The first step in the health promotion process was the administration of the HRA questionnaire (see Appendix A). This screening instrument is described in greater detail in the chapters that follow, but briefly, it queried the respondent on various health habits and behaviors and generated an individual risk profile. The HRA was typically administered by a community health nurse, who briefed the soldiers on the purposes of the questionnaire and reviewed the critical items that must be completed. On the basis of the individual's risk profile, he or she received a customized training program, which may have included medical or behavioral interventions, if warranted (e.g., a soldier may have been referred to a medical treatment facility for management of hypertension or to an education program such as smoking cessation or weight control). Participants were to be reevaluated after the medical or behavioral interventions, and, if they required additional intervention, be referred again as necessary.

Figure 2. Health Promotion Process



PCS = Permanent Change of Station; MTF = Medical Treatment Facility

AR 600-63 enumerated, as one of the responsibilities of the Army Surgeon General, the planning, implementation, and evaluation of "an automated health risk appraisal with procedures for administration and for processing and compiling the data at HQDA, MACOM, installation or community, and unit levels." Figure 2 shows that individual HRA survey responses were to be maintained in databases at both the installation level and Army-wide.

DEVELOPMENT OF THE ARMY'S HRA QUESTIONNAIRE

The Army had been conducting various health promotion activities throughout the 1960s, 1970s, and 1980s. When the DoD issued Directive 1010.10, requiring all of the services to design comprehensive health promotion programs, the Army formalized its activities in AR 600-63, and consolidated its various health and wellness programs under the Deputy Chief of Staff of Personnel (DCSPER). A committee was formed to select and customize a health risk appraisal questionnaire for use by the Army that would take into consideration the unique attributes of the Army population.

In the early stages of the program, this committee adopted the Rhode Island Wellness Check (RIWC) questionnaire as its vehicle for health risk assessment. An

automated HRA based on the RIWC had been designed for the Army in the fall of 1986 and was already in use as part of the revised periodic physical examination. The RIWC instrument had several features that made it appealing to the committee: it was developed specifically for a population of adolescents and young adults (i.e., similar to the Army's core demographic); it was readily available off the shelf; and it had electronic reporting features that would facilitate collection and retrieval of data on lifestyle risk factors in aggregate form for specific units, commands, or the Army as a whole. The committee in charge of selecting and developing an HRA instrument for Army-wide health promotion activities thus decided to implement the Army's adaptation of the RIWC.

However, previous health risk assessment activities in the Army had also used the Center for Disease Control and Prevention's (CDC) health risk appraisal. In the early 1980s, for example, there had been several exercise-related cardiovascular deaths that occurred during physical training, and there was some concern about whether the Army's fitness requirement might place some soldiers at risk of cardiac arrest. In approximately 1982-1983, the Army was using the CDC's HRA on at least one base (Ft. Leavenworth, KS) to see if it was useful in detecting prevalence of cardiovascular risk factors in a group of soldiers under age 40. It was also used to identify specific health conditions for individual follow up and to evaluate the utility of the CDC's HRA as both a primary cardiovascular screening tool and a method of initiating comprehensive risk intervention programs[1]. Therefore, in the early stages of the health promotion program, a decision was made to administer the adapted version of the RIWC, but the Army also had previous experience with the CDC's questionnaire and in 1989 would ultimately implement a customized HRA that incorporated items from both instruments.

In the late 1980s, the CDC and the Carter Center at Emory University embarked on a collaborative effort to update the CDC's HRA questionnaire and risk algorithms. As a result of this work, the CDC's public domain HRA was updated and the Carter Center obtained permission to offer a version of that HRA to corporate clients. Shortly thereafter, the Carter Center worked with the Army to adapt the Carter Center/CDC HRA for use by the Army. The HRA questionnaire that grew out of this revision process, and which was finally implemented by the Army, was a combination of items from the RIWC, the Carter Center/CDC's HRA, and other sources. This version of the HRA questionnaire was implemented in the fall of 1989 [Wilson, 1991 #36]. It is doubtful, given the degree of the logistical complexities involved, that all Army bases implemented this new version of the questionnaire at precisely the same time. Because of this, care should be taken in interpreting the composite risk assessment scores from the HRA data, as the methods of calculating overall risk profiles are very different between the RIWC and the Carter Center/CDC's HRA.

The Army offered the HRA to active-duty soldiers for more than a decade, finally ceasing formal requirements for the program in late 1998. The resulting databank of HRA survey responses contains a wealth of historical information about health habits

[1] MFR, CPT Sandy Yanney, September 1983.

and risk behaviors that may assist researchers in the study of health and wellness among Army soldiers. Before proceeding to use this information in quantitative research, however, an assessment of the psychometric properties of the questionnaire is appropriate. The next chapter introduces some basic concepts about reliability and validity, and reviews what is known about the validity of the risk scores calculated from the HRA.

Appendix C

Bell NS, Williams JO, Senier LS, Amoroso PJ. The U.S. Army's Health Risk Appraisal (HRA) Survey, Part II: Generalizability, Sample Selection, and Respondent Profile. Technical Note. Natick, MA: U.S. Army Research Institute of Environmental Medicine, Under review.

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USARIEM TECHNICAL REPORT TXX-XX

THE U.S. ARMY'S HEALTH RISK APPRAISAL (HRA) SURVEY, PART II: GENERALIZABILITY, SAMPLE SELECTION, AND RESPONDENT PROFILE

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LIST OF ACRONYMS

DMDC	Defense Manpower Data Center
DoD	Department of Defense
HEAR	Health Assessment Enrollment Review
HRA	Health Risk Appraisal
ICD-9-CM	International Classification of Diseases, Ninth Revision, Clinical Modification
PASBA	Patient Administration Systems and Biostatistical Activity
SSN	Social Security Number
TAIHOD	Total Army Injury and Health Outcomes Database
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine

EXECUTIVE SUMMARY

The U.S. Army Health Risk Appraisal (HRA) survey has been used widely to measure the general health of soldiers and to provide soldiers with feedback regarding their health and health behaviors. Because it includes extensive data on health behaviors and can be linked to subsequent encounters with the health care system, it has also become an important tool for epidemiologic research. However, the HRA was not offered to the entire Army population, nor was it systematically administered to those who did receive it. Therefore, it is not clear to whom results from analyses of HRA data can be generalized. The goals of this report are to describe the population of active duty Army soldiers who have taken the HRA and compare them to those who have not; to describe the demographic characteristics of HRA respondents who skip potentially sensitive items; and to describe respondents reporting extreme values for certain health behaviors.

The HRA survey data described in this report have been linked to the Total Army Injury and Health Outcomes Database (TAIHOD). The TAIHOD includes data from different administrative sources including hospitalizations, deaths, and personnel data such as demographic information and occupational characteristics. Before qualifying the HRA surveys for inclusion in the TAIHOD, the surveys were systematically evaluated to ensure that all respondents were active duty service members. Many civilian employees, retirees, or dependents of active-duty soldiers also took the HRA; this report focuses on a more carefully qualified group of active duty survey respondents than were perhaps included in other reports that used HRA data. Our data cleaning and qualification process also discarded many duplicate and near-duplicate surveys, an issue possibly overlooked by other users of the Army HRA database. Most analyses presented here are descriptive and include frequencies, percentages, means, standard deviations, and ranges of values.

The HRA program began in 1987, but only a relatively small number of HRA surveys were administered prior to 1990. Before 1990 there were significant differences in the composition of HRA takers and nontakers, with those who took an HRA being more likely to be older, married, female, and officers than the Army population at large. Researchers should use caution in interpreting survey data from these early years. After 1990, as the survey became used more widely throughout the Army, the distribution of demographic characteristics of HRA takers and nontakers more closely represents the demographic distribution of the Army as a whole. This probably stems from the fact that the majority of surveys were offered to soldiers in-processing to new units and to those who were receiving a periodic physical exam. Despite not being systematically offered to a random sample of soldiers there does not appear to be bias in terms of oversampling of soldiers who were ill. HRA takers were no more or less likely to have been hospitalized than those who did not take an HRA. There is relatively little missing data on the HRA even for sensitive items. While those who skip sensitive items are more likely to be from minority groups and slightly more likely to be male, the total proportion of respondents who skip sensitive items is quite small. A small portion of respondents report extreme, or outlying values on certain items (e.g., weekly alcohol

consumption in excess of 30 drinks). These same respondents were more likely to express suicidal ideation, possibly suggesting they may indeed be at extremely high risk, or are perhaps deliberately misreporting extreme values in order to seek help or intervention from the survey administrator.

INTRODUCTION

The U.S. Army Health Risk Appraisal (HRA) survey has been widely used over the past decade to measure the general health of soldiers and to provide soldiers with feedback regarding their health and health behaviors. A companion report to this document details the history of this survey and originating sources for the survey items (12). While the HRA was intended as a health promotion tool it has also become a useful source of information for epidemiologists and health researchers. However, because the HRA was not offered to the entire Army population, nor was the population who were offered the survey selected systematically, it is not clear to whom results from analyses of HRA data can be generalized. Some civilian studies of health risk appraisal questionnaires suggest that survey takers may differ from nontakers with respect to important risk factors such as age, gender, educational attainment, and health status (5). A report of the Navy's experience with a different HRA than the one in use by the Army noted that Navy HRA respondents were older, better educated, smoked less and drank less alcohol, and used seat belts more often than nonrespondents (10). A study of HRA takers in a corporate environment paradoxically found that although HRA respondents reported lower levels of health risks at baseline, they filed more health claims and had higher claims costs than nonresponders (9). The picture that emerges could thus indicate that HRA responders may be more health-conscious than nonresponders, or that they may represent the "worried well." Moreover, the Army's HRA was not taken anonymously. It is possible that some soldiers, fearing reprisals for certain types of responses, may have skipped some of the more sensitive items (e.g., those pertaining to alcohol consumption habits). If these tendencies were more common among certain subgroups of Army soldiers (e.g., soldiers of certain age, racial/ethnic, or gender groups) then this might distort the information the HRA yields and should be considered before interpreting or making policy decisions based upon these data.

The goal of this report is to describe the population of active duty Army soldiers who have taken the HRA and compare them to those who have not. This relates to the external validity, or generalizability, of the HRA as well as potential selection bias. This report will also describe the demographic characteristics of HRA respondents who skip certain potentially sensitive items as compared to those who complete them and explores the demographic characteristics of respondents who report extreme values for certain health behaviors.

METHODS

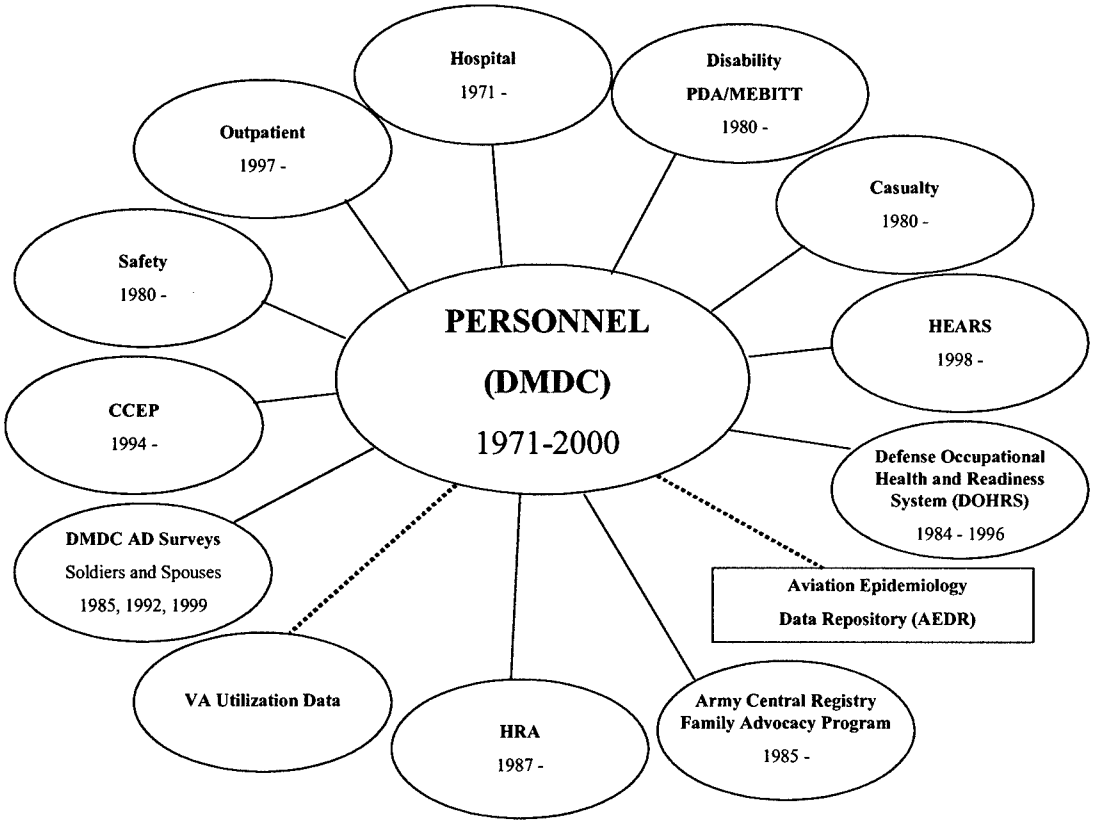
THE DATA

Historically, Army HRA data were collected worldwide, sent (usually via computer disk) to a centralized database, and then consolidated at the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM, Aberdeen Proving Ground, Maryland). Individual soldiers may have multiple opportunities to take an HRA over the course of an Army career resulting in a significant number of repeat respondents in the

database. On average 3-4% of the HRAs taken each year represent surveys taken by individuals who have taken it previously. Overall, about 80% of the total number of HRAs completed are from first-time respondents and the remaining 20% comprise those who have taken the HRA more than once. Fewer than 2% of active duty soldiers have taken the HRA more than twice. A copy of the HRA questionnaire appears in Appendix A.

While the HRA data alone provide a rich source of information important to understanding the health and health behaviors of active duty servicemembers and their families, their greatest potential may be attained through linkage with other health databases. The HRA have been linked to one such database, the Total Army Injury and Health Outcomes Database (TAIHOD, see Figure 1). The core of the TAIHOD includes demographic and personnel information on more than five million active duty Army soldiers dating as far back as 1971. Various administrative databases have been linked to the TAIHOD, with information on a variety of health outcomes (e.g., inpatient hospitalization records since 1970, outpatient encounters since 1997, accidents reported to the Army Safety Center), exposure information (e.g., toxic substance exposure data, deployment activation files), and health habit data from the HRA. Information in the database is linked by encrypted Social Security Numbers (SSNs) at the level of the individual soldier.

Figure 1. The Total Army Injury and Health Outcomes Database (TAIHOD)



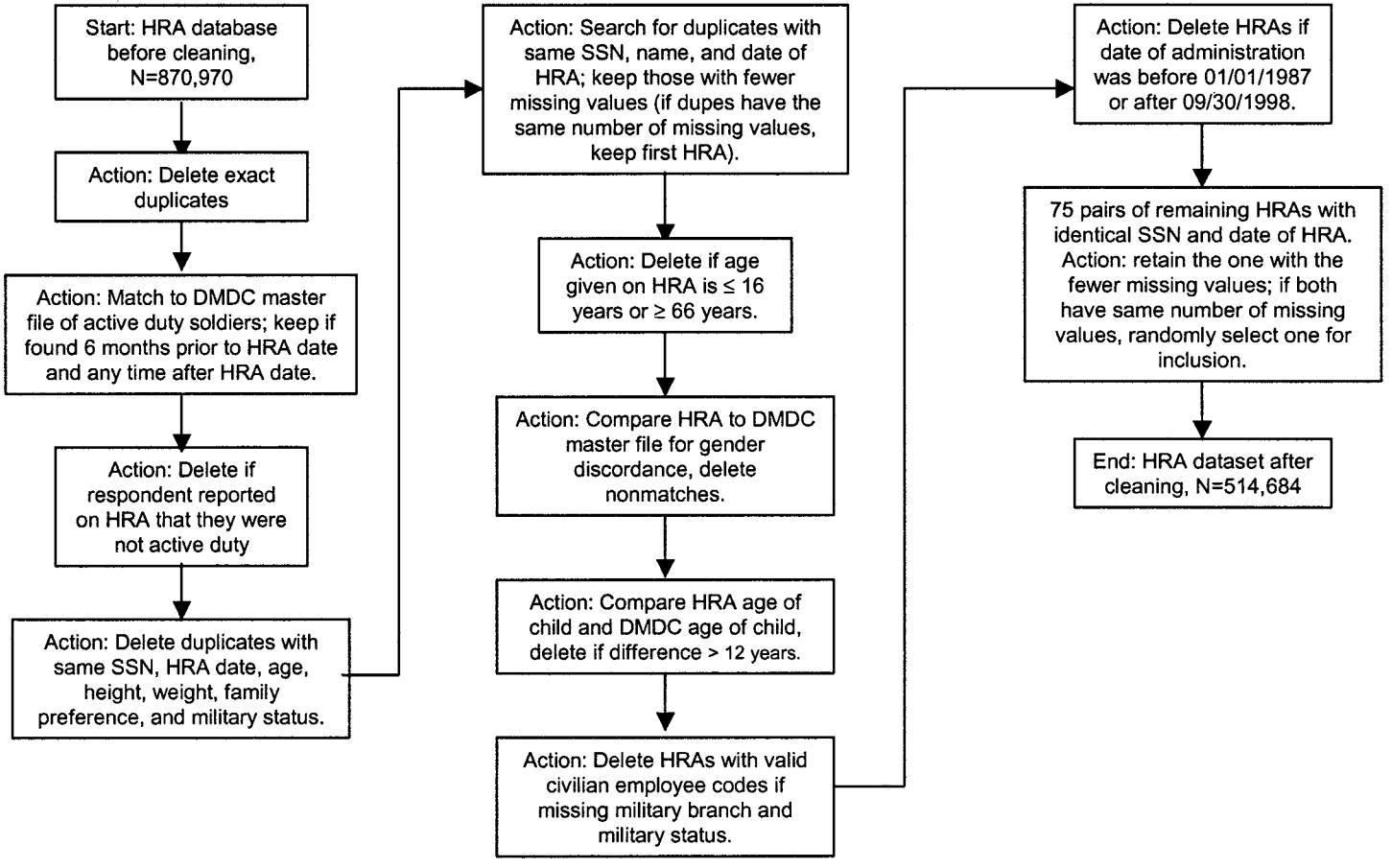
LINKING THE HRA DATA TO THE TAIHOD

There were two processes by which a soldier may have taken the HRA: a computer-scannable form and interactive computer session, the first method being the more common one. Soldiers recorded their responses to the HRA items directly on the survey form, which had perforated edges, allowing separation of the answer sheet from the survey. The forms were then put through a computer scanner. A health promotion nurse or technician then generated a risk profile for the respondent and reviewed it with them. The second method entailed reading the survey items on a computer screen and selecting appropriate responses with computer keys. In both cases, a date field was recorded and became part of the specific data file associated with that individual's HRA. This is important as it allows us to control for temporal sequence and to measure risk behaviors prior to health events such as injuries and illnesses.

Although not offered to soldiers through a random sampling process, surveys were administered in a variety of settings including routine in-processing to a new base or duty assignment, during routine physical examinations, during routine physical fitness testing, at walk-in clinics or occupational health centers, or via other mechanisms. Some family members, retirees, and Department of the Army civilian employees were also offered surveys. It is common practice for dependents of military servicemembers to use the servicemember's SSN to access military benefits, especially military medical benefits such as the HRA. It is therefore important that researchers using the HRA database determine whether the surveys being evaluated are those of an active duty servicemember or those of a civilian employee, retiree, or family member. In addition, our investigation of HRA data suggests that many surveys are duplicates or near duplicates. Duplicate surveys may have been included in the database if a survey was inadvertently sent through the scanning machine more than once. In many cases, near duplicate surveys occur with the same administration date. Anecdotal evidence suggests that this might have occurred if a soldier submitted a survey to the administrator, the survey was scanned and then the administrator noticed an omitted response. The administrator may have directed the survey taker to complete the item before rescanning the survey and generating a final risk report.

In order to address concerns regarding the true identity of the survey taker and problems with duplicate responses we have taken a restrictive approach to qualifying survey respondents for the purposes of our research (see Figure 2 below). We began with an intensive and scrupulous process of error checking and review of the HRA files we received from CHPPM. We took a restrictive approach to removing duplicates and near duplicates, as well as individuals who we could not confirm as being active-duty servicemembers. Details on the steps taken to prepare this database are shown in Figure 2.

Figure 2. HRA Data Qualifying Process to Match HRAs to Active-Duty Soldiers in the Total Army Injury and Health Outcomes Database



In addition to cleaning the HRA data of duplicate surveys, we have linked individuals with completed surveys to the personnel files in the TAIHOD. In addition to matching on SSN, we also compared the gender and age of the HRA respondents to their personnel records. The HRA includes an item that queries about duty status, and we excluded respondents who did not indicate that they were on active duty. We thus have a high degree of certainty that all data reported here are from HRAs that were taken by active duty Army soldiers.

This report includes TAIHOD data from the HRA, Army personnel files, and records of inpatient hospitalizations. Personnel files were originally obtained from the Defense Manpower Data Center (DMDC) and include demographic data, occupational information, and discharge information (e.g., dates of service and reason for discharge). These data are updated semiannually. The hospital data comes from the Patient Administration Systems and Biostatistical Activity (PASBA). We used dates of admission and ICD-9-CM codes for conditions. To define injury-related hospitalizations we included all admissions with primary diagnosis in the 800-959 range.

ANALYTIC APPROACH

The HRA survey (DA Form 5675) was issued in May 1988, and revised in October of 1990 and again in February of 1992. It is uncertain what instructions were given to replace versions of the form, but it is probable that individual bases exhausted the existing inventory of the form before switching to the new version. Changes between the October 1990 version and the February 1992 version were generally very minor, although one change had a substantial impact on our ability to thoroughly evaluate missing responses to alcohol items. In the October 1990 version of the survey, respondents were instructed to skip items 29-34 asking about alcohol-related problems if they reported in item 28 that they did not drink. This skip instruction was deleted from the February 1992 version of the survey. Although the electronic data files do indicate the date of survey administration, they do not have a variable that indicates which version of the survey was taken. Transition to the newer version of the survey likely took place over a period of several years. We first documented the proportion of HRA respondents who were missing responses to items 29-34, in order to see if we could detect when this transition may have been fully realized. This analysis suggested that for the years 1992-1994, it is difficult to parse out which soldiers legitimately did not respond to items 29-34 (because they were instructed to skip them) and which soldiers may have skipped them because they did not want to divulge this information. To address this complexity we compared the demographic characteristics of all HRA takers with those soldiers who were missing responses to items 29-34 despite reporting drinking at least one drink per week on item 28. Respondents who reported any alcohol use should have answered items 29-34 regardless of which version of the survey they took.

Most analyses presented here are descriptive and include frequencies, percentages, means, standard deviations, and ranges of values. SAS version 8.01 (SAS Institute, Cary, NC) was used for most analyses. Microsoft Excel 2000 (Microsoft

Corporation, Redmond, WA) was used to calculate population-based rates and to display data in some of the figures. The analyses conducted for this paper adhere to the policies for protection of human subjects as prescribed in Army Regulation 70-25 and with the provisions of 45 CFR 46.

RESULTS

WHO TAKES THE HRA? DEMOGRAPHIC CHARACTERISTICS OF HRA TAKERS OVER TIME

Figure 3 shows the number and proportion of Army soldiers who took an HRA in each year from 1987 through 1998. Prior to 1990 on average 11 per 100,000 active duty soldiers took a survey each year. The proportion of the Army who took an HRA increased steadily until about 1992 when the HRA administration rate reached an all time high. More than 10% of the Army on active duty that year took the survey (N=92,148). After 1992, survey administration rates began to decline and in 1998, 14,435 surveys were administered (about 2.6% of total Army on active duty that year). In 1998 the Army replaced the HRA with the Health Enrollment Assessment Review (HEAR), although the HRA is still in use at a small number of active duty installations and is still being used by the Army Reserve.

Figure 3. Total Active-Duty Army Population and Number of Active-Duty Army Soldiers Who Took the HRA, 1987-1998

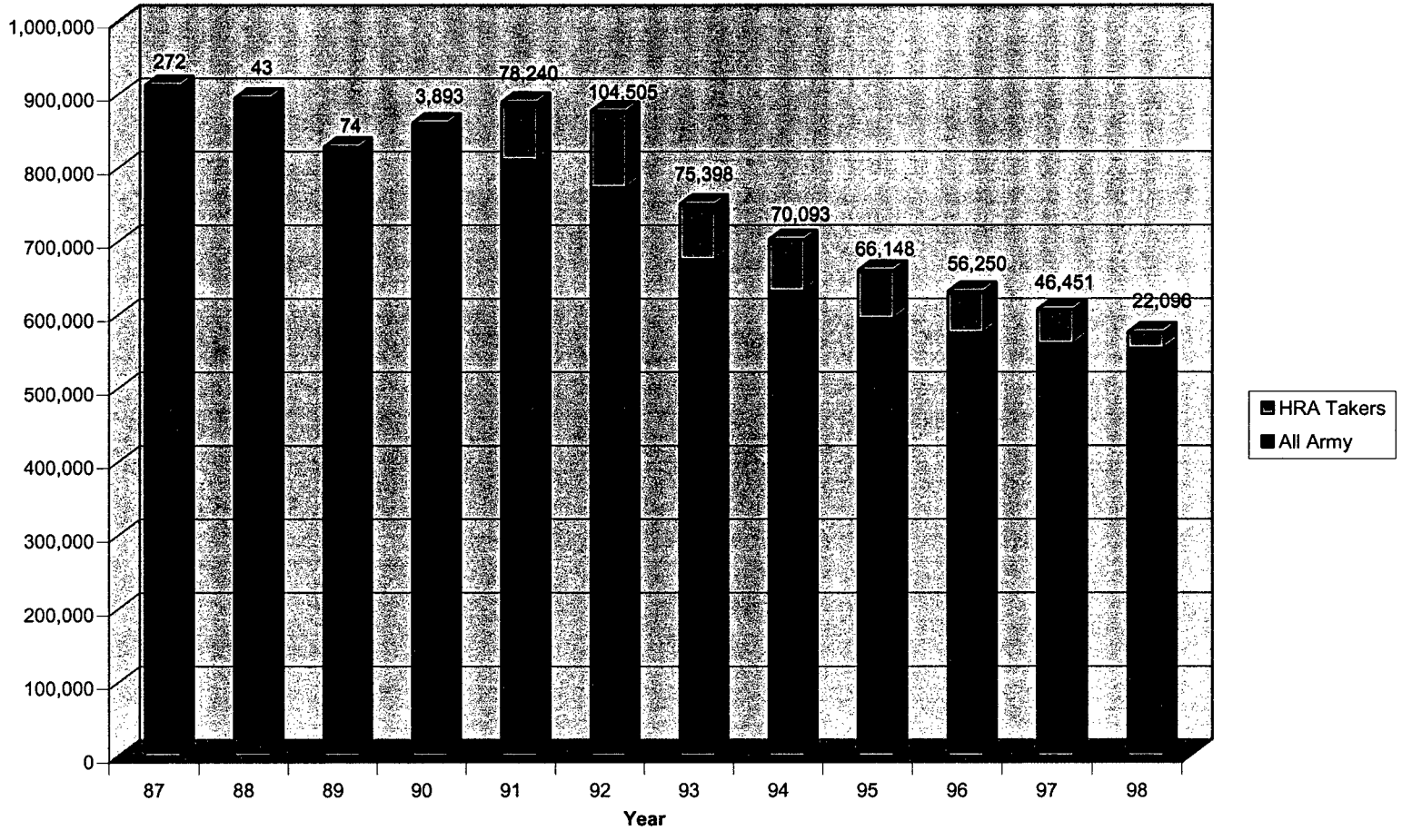


Table 1 shows the age distribution of soldiers who took an HRA in a given year and those who did not take an HRA but who were on active duty during that same year from 1987-1998. Prior to 1990, HRA takers were significantly older than those who did not complete an HRA. After 1990, HRA takers and nontakers were generally the same age.

Table 1. Number and Age of Active-Duty Army HRA Takers and Nontakers, 1987-1998

Year	HRA Status	N	Mean Age (Range)
1987	Takers	182	30.5 (19-47)
	Nontakers	728,592	26.5 (17-81)
1988	Takers	41	31.4 (20-46)
	Nontakers	691,361	26.8 (17-82)
1989	Takers	73	34.9 (20-50)
	Nontakers	656,823	26.9 (17-83)
1990	Takers	3,592	28.0 (18-60)
	Nontakers	595,048	27.2 (17-81)
1991	Takers	74,010	28.9 (17-64)
	Nontakers	521,815	27.7 (17-83)
1992	Takers	91,986	28.7 (17-84)
	Nontakers	458,532	28.0 (17-84)
1993	Takers	58,914	28.0 (17-66)
	Nontakers	363,049	27.8 (17-83)
1994	Takers	49,955	27.4 (18-80)
	Nontakers	329,677	27.8 (17-83)
1995	Takers	45,204	27.7 (17-64)
	Nontakers	306,761	27.6 (17-72)
1996	Takers	36,945	27.0 (17-66)
	Nontakers	302,609	27.2 (17-73)
1997	Takers	30,907	25.9 (17-77)
	Nontakers	312,780	26.8 (17-77)
1998	Takers	14,405	25.8 (17-58)
	Nontakers	330,833	26.5 (17-71)

Table 2 also depicts age by year and whether the individuals took an HRA in that year, but age is displayed in standard increments to allow comparison to other data sources. This table demonstrates more clearly the changing composition of survey respondents over time. The age differences began to dissipate in 1990. After 1990, however, soldiers under age 21 are slightly over represented among HRA takers; this trend persists throughout 1998. Also noteworthy is the relatively small amount of missing data on age for both HRA takers and nontakers.

Table 2. Proportion of Active-Duty Army HRA Takers and Nontakers, by Age and Year, 1987-1998

Year	HRA Status	N	Missing	<21 years	21-25 years	26-30 years	31-35 years	36-40 years	>40 years
1987	Takers	183	0.6	7.1	19.1	21.9	27.9	20.2	3.3
	Nontakers	739,253	1.4	19.0	37.2	18.3	10.6	8.0	5.5
1988	Takers	41	0.0	4.9	19.5	7.3	43.9	22.0	2.4
	Nontakers	701,873	1.5	18.1	36.7	18.6	11.1	7.8	6.1
1989	Takers	74	1.4	1.4	6.8	12.2	32.4	32.4	13.5
	Nontakers	667,024	1.5	17.8	36.0	19.2	11.5	7.6	6.4
1990	Takers	3,600	0.2	17.7	28.3	19.9	15.7	11.5	6.8
	Nontakers	604,461	1.6	16.1	35.2	20.1	12.3	8.2	6.7
1991	Takers	74,127	0.2	12.6	29.7	20.8	15.0	12.6	9.1
	Nontakers	530,857	1.7	12.6	35.6	20.8	13.3	8.9	7.2
1992	Takers	92,148	0.2	13.0	30.9	20.0	15.2	12.3	8.5
	Nontakers	466,870	1.8	11.7	34.5	20.6	14.3	10.0	7.2
1993	Takers	59,080	0.3	14.4	34.3	19.1	13.4	11.5	7.1
	Nontakers	371,776	2.4	13.6	34.2	19.3	13.2	10.2	7.0
1994	Takers	50,115	0.3	16.9	33.8	19.7	12.9	10.6	5.7
	Nontakers	337,074	2.2	14.2	34.0	19.1	13.5	10.5	6.5
1995	Takers	45,306	0.2	16.3	32.3	19.9	14.7	11.0	5.6
	Nontakers	313,202	2.1	14.0	34.9	19.1	13.6	10.3	6.2
1996	Takers	36,983	0.1	19.9	33.5	18.4	12.9	9.8	5.4
	Nontakers	311,422	2.8	16.1	34.5	19.1	12.9	9.2	5.5
1997	Takers	30,983	0.3	24.5	34.9	18.6	10.7	7.1	4.0
	Nontakers	318,161	1.7	18.8	34.3	19.2	12.4	8.7	5.0
1998	Takers	14,435	0.2	23.3	35.1	20.3	10.7	6.9	3.4
	Nontakers	338,880	2.4	20.0	34.6	19.0	11.6	7.9	4.6

Over time, the gender distribution of the Army has changed substantially. In 1980, women represented 9% of the Army population, and by 1994, they represented 13% (13). The average age of women on active duty also increased as more women made careers of military service. Table 3 shows the gender composition of HRA takers and nontakers by year of HRA administration. Again, in the early years of survey administration (pre-1990) relatively more female soldiers completed HRAs than males (as a proportion of the total Army on active duty in that year).

Table 3. Proportion of Active-Duty Army HRA Takers and Nontakers, by Gender and by Year of HRA Administration, 1987-1998

Year	HRA Status	N	Unknown (%)	Male (%)	Female (%)
1987	Takers	183	0.0	85.8	14.2
	Nontakers	739,253	1.3	87.9	10.8
1988	Takers	41	0.0	70.7	29.3
	Nontakers	701,873	1.4	87.6	11.0
1989	Takers	74	0.0	75.7	24.3
	Nontakers	667,024	1.4	87.2	11.4
1990	Takers	3,600	0.2	88.1	11.7
	Nontakers	604,461	1.5	87.0	11.5
1991	Takers	74,127	0.1	88.6	11.4
	Nontakers	530,857	1.6	87.2	11.3
1992	Takers	92,148	0.3	87.6	12.2
	Nontakers	466,870	1.7	86.8	11.5
1993	Takers	59,080	0.1	87.1	12.8
	Nontakers	371,776	2.2	85.7	12.1
1994	Takers	50,115	0.1	85.8	14.0
	Nontakers	337,074	2.1	85.2	12.7
1995	Takers	45,306	0.1	84.5	15.4
	Nontakers	313,202	2.2	84.9	13.2
1996	Takers	36,983	0.1	83.7	16.2
	Nontakers	311,422	2.8	83.2	14.0
1997	Takers	30,983	0.6	82.7	16.7
	Nontakers	318,161	1.7	83.2	15.1
1998	Takers	14,435	0.2	83.8	16.0
	Nontakers	338,880	2.3	82.5	15.2

Prior to 1991, servicemembers who had been on active duty longer were more likely to take an HRA. After that point the trend seems to be reversed with those on active duty for shorter durations being more likely to complete an HRA (Table 4).

Table 4. Active-Duty Army HRA Takers and Nontakers, Mean Time in Service in Months, 1987-1998

Year	HRA Status	N	Mean Time in Service in Months (Range)
1987	Takers	183	95.0 (1-255)
	Nontakers	739,253	72.4 (0-420)
1988	Takers	41	101.2 (4-205)
	Nontakers	701,873	74.8 (0-420)
1989	Takers	74	123.7 (1-244)
	Nontakers	667,024	76.0 (0-420)
1990	Takers	3,600	85.3 (0-398)
	Nontakers	604,461	79.7 (0-420)
1991	Takers	74,127	90.4 (0-420)
	Nontakers	530,857	84.6 (0-420)
1992	Takers	92,148	86.2 (0-420)
	Nontakers	466,870	87.1 (0-420)
1993	Takers	59,080	76.9 (0-420)
	Nontakers	371,776	84.8 (0-420)
1994	Takers	50,115	70.5 (0-420)
	Nontakers	337,074	83.6 (0-420)
1995	Takers	45,306	74.2 (0-420)
	Nontakers	313,202	F81.9 (0-420)
1996	Takers	36,983	64.2 (0-420)
	Nontakers	311,422	75.9 (0-420)
1997	Takers	30,983	51.3 (0-420)
	Nontakers	318,161	70.9 (0-420)
1998	Takers	14,435	51.7 (0-420)
	Nontakers	338,880	67.06 (0-420)

HRA takers were more likely to be married in early years (prior to 1992) at which point the trend reverses and HRA takers were less likely to be married. HRA takers from 1992 through 1998 were more likely to be single. HRA takers prior to 1990 were more likely to be widowed or divorced. However, after 1990 there are no meaningful differences in the proportion of HRA takers and nontakers who are no longer married (divorced or widowed) (see Table 5).

Table 5. Active-Duty Army HRA Takers and Nontakers, Proportionally by Marital Status and by Year of HRA Administration, 1987-1998

Year	HRA Status	N	Unknown	Single	Married	No longer Married
1987	Takers	183	0.0	26.8	69.4	3.8
	Nontakers	739,253	1.4	45.5	49.7	3.4
1988	Takers	41	0.0	19.5	70.7	9.8
	Nontakers	701,873	1.5	44.6	50.5	3.5
1989	Takers	74	0.0	20.3	73.0	6.8
	Nontakers	667,024	1.5	44.1	50.9	3.5
1990	Takers	3,600	0.3	40.0	55.4	4.3
	Nontakers	604,461	1.7	42.4	52.3	3.7
1991	Takers	74,127	0.4	38.6	57.0	4.1
	Nontakers	530,857	3.4	41.0	50.8	3.8
1992	Takers	92,148	13.1	40.6	42.4	3.9
	Nontakers	466,870	7.2	39.7	48.2	3.9
1993	Takers	59,080	1.3	43.6	51.4	3.8
	Nontakers	371,776	2.4	40.3	53.4	3.9
1994	Takers	50,115	0.3	44.9	51.0	3.8
	Nontakers	337,074	2.4	40.3	53.4	3.9
1995	Takers	45,306	0.4	43.3	52.4	4.0
	Nontakers	313,202	2.2	41.5	52.5	3.8
1996	Takers	36,983	0.2	49.0	47.2	3.6
	Nontakers	311,422	3.1	43.5	49.7	3.7
1997	Takers	30,983	0.6	55.1	41.0	3.3
	Nontakers	318,161	1.8	46.5	48.0	3.7
1998	Takers	14,435	0.4	56.0	40.6	3.0
	Nontakers	338,880	2.5	48.9	45.1	3.5

As with other demographic variables, soldiers who took an HRA prior to 1990 were more likely to have two or more dependents (mostly reflecting soldiers who are older and who are married with children). From 1991 through 1993, the HRA takers and nontakers appear more similar in this regard until 1994, when HRA takers were more likely to have no dependents than their HRA nontaker counterparts (see Table 6).

Table 6. Active Duty Army Takers and Nontakers, Proportionally by Number of Dependents and by Year of Administration, 1987-1998

Year	HRA Status	N	Unknown	Member only	Member +1	Member +2	Member +3	Member +4	Member +5	Member +6	Member +7	Member +8-15
1987	Takers	183	0.0	33.9	12.6	18.6	19.1	10.9	2.7	1.6	0.0	0.6
	Nontakers	739,253	1.5	47.7	16.3	13.6	13.0	5.5	1.8	0.4	0.1	0.1
1988	Takers	41	0.0	29.3	26.8	12.2	14.6	12.2	4.9	0.0	0.0	0.0
	Nontakers	701,873	1.6	46.6	16.7	13.8	13.3	5.6	1.8	0.5	0.1	0.1
1989	Takers	74	1.4	28.4	13.5	18.9	25.7	10.8	1.4	0.0	0.0	0.0
	Nontakers	667,024	1.7	46.2	16.8	13.9	13.4	5.6	1.8	0.4	0.1	0.1
1990	Takers	3,600	0.5	41.8	17.3	14.1	15.8	7.1	2.6	0.6	0.1	0.0
	Nontakers	604,461	1.7	44.6	17.1	14.3	13.8	5.8	1.9	0.5	0.1	0.1
1991	Takers	74,127	0.3	40.7	16.1	15.5	16.7	7.5	2.3	0.6	0.2	0.1
	Nontakers	530,857	1.8	43.4	17.1	14.6	14.3	6.1	2.0	0.5	0.1	0.1
1992	Takers	92,148	0.2	43.0	15.9	14.8	16.2	7.0	2.2	0.5	0.2	0.1
	Nontakers	466,870	1.7	42.2	17.0	14.9	14.9	6.5	2.1	0.5	0.2	0.1
1993	Takers	59,080	0.6	45.5	15.6	14.4	15.1	6.3	2.0	0.4	0.2	0.1
	Nontakers	371,776	2.4	42.8	16.9	15.5	14.5	6.2	2.0	0.5	0.1	0.1
1994	Takers	50,115	1.2	46.5	16.2	14.2	14.0	5.7	1.7	0.4	0.1	0.0
	Nontakers	337,074	2.1	43.0	17.1	14.7	14.4	6.1	1.9	0.4	0.1	0.1
1995	Takers	45,306	0.1	46.0	16.3	14.6	14.6	6.0	1.8	0.4	0.1	0.0
	Nontakers	313,202	2.0	44.0	17.1	14.5	14.1	5.9	1.8	0.4	0.1	0.1
1996	Takers	36,983	0.1	51.0	15.5	13.6	12.7	5.2	1.5	0.3	0.1	0.0
	Nontakers	311,422	2.8	46.0	16.7	14.0	13.1	5.3	1.6	0.4	0.1	0.0
1997	Takers	30,983	0.2	56.8	15.0	12.4	10.4	3.9	1.1	0.3	0.1	0.0
	Nontakers	318,161	1.7	48.8	16.4	13.7	12.5	5.0	1.5	0.3	0.1	0.0
1998	Takers	14,435	0.3	57.5	15.5	12.1	9.7	3.5	1.1	0.3	0.1	0.0
	Nontakers	338,880	2.4	51.1	15.9	12.8	11.6	4.5	1.4	0.3	0.1	0.0

As a rule, there are more enlisted soldiers than officers in the Army. Between 1980 and 1994, the proportional split between enlisted soldiers and officers was approximately 85/15 (13). Data shown in Table 7 indicate, however, that in early years officers were over represented among HRA takers. By the early 1990s this had equalized. Surveys administered prior to 1991 also seem to oversample from soldiers employed in health care occupational specialties, among both enlisted and officers (data not shown).

Table 7. Active-Duty Army HRA Takers and Nontakers, Proportionally by Rank and by Year of HRA Administration, 1987-1998

Year	HRA Status	N	Unknown	Enlisted Unknown	E1-E4	E5-E9	Warrant Officer	Officer Unknown	O1-O3	O4-O5	O6-O11
1987	Takers	183	0.0	0.0	27.3	48.6	2.7	0.0	10.9	10.34	0.0
	Nontakers	739,253	1.3	0.0	56.6	30.7	1.6	0.0	6.3	2.9	0.7
1988	Takers	41	0.0	0.0	34.2	43.9	2.4	0.0	12.2	7.3	0.0
	Nontakers	701,873	1.4	0.0	57.2	30.0	1.6	0.0	6.4	2.8	0.7
1989	Takers	74	0.0	0.0	5.41	47.3	4.1	0.0	21.6	21.6	0.0
	Nontakers	667,024	1.4	0.0	56.6	30.5	1.6	0.0	6.3	2.8	0.6
1990	Takers	3,600	0.2	0.0	48.1	37.4	1.5	0.0	6.6	5.6	0.6
	Nontakers	604,461	1.5	0.0	54.8	31.9	1.7	0.0	6.6	3.0	0.7
1991	Takers	74,127	0.1	0.0	45.9	39.4	2.0	0.0	6.9	5.0	0.8
	Nontakers	530,857	1.5	0.0	53.3	32.9	1.8	0.0	6.6	3.2	0.7
1992	Takers	92,148	0.0	0.0	48.8	37.5	2.1	0.0	6.5	4.3	0.8
	Nontakers	466,870	1.6	0.0	51.5	34.2	1.8	0.0	6.9	3.4	0.7
1993	Takers	59,080	0.0	0.0	51.2	34.3	1.8	0.0	7.9	4.0	0.7
	Nontakers	371,776	2.1	0.0	51.2	33.2	2.0	0.0	7.1	3.7	0.8
1994	Takers	50,115	0.1	0.0	53.8	30.8	1.8	0.0	9.3	3.7	0.5
	Nontakers	337,074	2.0	0.0	51.7	32.9	2.0	0.0	7.1	3.6	0.7
1995	Takers	45,306	0.0	0.0	52.5	32.0	2.3	0.0	8.8	3.9	0.5
	Nontakers	313,202	1.9	0.0	53.5	31.0	2.0	0.0	7.3	3.6	0.6
1996	Takers	36,983	0.1	0.0	57.5	26.4	1.6	0.0	9.8	4.2	0.4
	Nontakers	311,422	2.7	0.0	54.7	29.3	1.9	0.1	7.4	3.4	0.6
1997	Takers	30,983	0.1	0.0	66.4	22.9	1.4	0.1	7.1	1.8	0.2
	Nontakers	318,161	1.5	0.1	57.4	28.1	1.8	0.1	7.4	3.2	0.5
1998	Takers	14,435	0.1	0.1	65.5	22.7	1.4	0.1	7.9	2.1	0.2
	Nontakers	338,880	2.2	0.0	59.5	25.7	1.7	6.5	7.3	3.0	0.5

Table 8 reveals some bias in the distribution of HRAs by race/ethnicity. Surveys administered prior to 1990 appear to oversample from minority racial/ethnic groups. However, this trend seems to disappear after 1991.

Table 8. Active-Duty Army HRA Takers and Nontakers, Proportionally by Race/Ethnicity and by Year of HRA Administration, 1987-1998

Year	HRA Status	N	Unknown	White	Black	Hispanic	Indian/ Alaskan	Asian/ Pacific Islander	Other
1987	Takers	183	0.0	57.4	30.6	7.1	0.6	3.3	1.1
	Nontakers	739,253	1.3	66.9	24.7	3.5	0.5	1.4	1.8
1988	Takers	41	0.0	46.3	46.3	4.9	2.4	0.0	0.0
	Nontakers	701,873	1.4	65.9	24.1	3.5	0.5	1.5	2.0
1989	Takers	74	1.4	75.7	17.6	2.7	0.0	1.4	1.4
	Nontakers	667,024	1.5	64.9	25.8	3.7	0.6	1.5	2.1
1990	Takers	3,600	0.3	59.9	35.7	2.1	0.4	0.7	1.0
	Nontakers	604,461	1.5	64.0	26.3	3.8	0.6	1.6	2.2
1991	Takers	74,127	0.1	62.0	31.3	3.1	0.5	1.2	1.9
	Nontakers	530,857	1.7	63.4	26.4	4.0	0.6	1.7	2.4
1992	Takers	92,148	0.0	62.6	28.2	4.5	0.6	1.9	2.3
	Nontakers	466,870	1.6	62.5	26.8	4.2	0.6	1.8	2.6
1993	Takers	59,080	0.1	63.7	26.2	5.1	0.6	2.1	2.3
	Nontakers	371,776	2.2	62.5	25.7	4.5	0.6	1.9	2.6
1994	Takers	50,115	0.1	63.7	26.0	5.1	0.6	2.2	2.3
	Nontakers	337,074	2.1	62.3	25.4	4.8	0.6	2.0	2.8
1995	Takers	45,306	0.1	62.8	26.1	5.6	0.6	2.4	2.5
	Nontakers	313,202	2.1	62.0	24.9	5.2	0.6	2.2	3.0
1996	Takers	36,983	0.1	62.1	26.0	6.2	0.6	2.5	2.4
	Nontakers	311,422	2.9	60.9	24.4	5.8	0.7	2.4	3.0
1997	Takers	30,983	0.1	59.6	26.0	8.3	0.7	2.6	2.6
	Nontakers	318,161	1.7	60.9	24.6	6.8	0.7	2.5	2.3
1998	Takers	14,435	0.2	60.5	25.1	8.3	0.8	2.8	2.3
	Nontakers	338,880	2.4	59.8	24.3	7.4	0.7	2.7	2.7

Table 9 documents the reason why individuals took an HRA, for first-time HRA takers and all HRA takers in that same year. Before 1990 the most common reason for taking the HRA was during routine physical examinations. After 1990 the most common mechanism for HRA administration was in-processing to a new base or job assignment, followed by physical exam and those categorized as "other." Administration for other reasons might include surveys administered to a unit at the request of the command and surveys administered to individuals during outpatient encounters.

Table 9. Reason for Taking the HRA for First Time Active-Duty Army HRA Takers and All Active-Duty Army HRA Takers, by Year of HRA Administration, 1987-1998

Year	HRA Status	N	Missing Data (%)	In-Processing (%)	Periodic Physical Exam (%)	Pre-Physical Fitness Test (%)	Occupational Health Program (%)	Walk-in (%)	Other (%)
1987	First time Takers	183	3.3	11.5	67.8	1.6	0.6	2.2	13.1
	All Takers	272	2.6	15.4	57.4	2.2	0.4	3.7	18.4
1988	First time Takers	41	2.4	0.0	97.6	0.0	0.0	0.0	0.0
	All Takers	43	2.3	0.0	97.7	0.0	0.0	0.0	0.0
1989	First time Takers	74	2.7	1.4	50.0	1.4	6.8	23.0	14.9
	All Takers	74	2.7	1.4	50.0	1.4	6.8	23.0	14.9
1990	First time Takers	3,600	1.5	65.2	14.4	0.5	2.7	4.5	11.1
	All Takers	3,893	1.5	67.4	13.5	0.5	2.5	4.2	10.4
1991	First time Takers	74,127	1.5	47.0	21.7	0.9	3.5	7.0	18.5
	All Takers	78,240	1.5	45.8	22.3	1.0	3.5	6.9	19.0
1992	First time Takers	92,148	1.5	54.4	20.2	0.6	2.5	4.1	16.7
	All Takers	104,505	1.6	51.0	22.0	0.8	2.7	4.1	17.9
1993	First time Takers	59,080	1.2	57.5	17.3	0.6	2.5	3.1	18.0
	All Takers	75,398	1.2	51.5	20.3	0.6	2.6	3.1	20.7
1994	First time Takers	50,115	0.7	62.1	16.9	0.9	2.2	1.2	16.2
	All Takers	70,093	1.3	54.6	20.0	1.0	2.9	1.3	19.0
1995	First time Takers	45,306	0.7	61.1	22.3	0.7	2.2	1.0	12.0
	All Takers	66,148	0.8	55.5	22.6	0.8	3.5	1.1	13.7
1996	First time Takers	36,983	1.6	71.5	14.6	0.5	2.0	0.9	9.0
	All Takers	56,250	1.7	63.9	18.5	0.6	3.1	1.1	11.0
1997	First time Takers	30,983	0.6	80.8	9.5	0.2	0.9	0.5	7.6
	All Takers	46,451	0.6	72.4	14.7	0.3	1.8	0.6	9.7
1998	First time Takers	14,435	1.0	72.5	6.8	0.2	0.7	0.8	18.0
	All Takers	22,096	0.9	64.4	12.9	0.3	1.1	1.1	19.3

Table 10 shows reason for taking the HRA for first-time HRA takers, for the entire sample, and stratified by year, age, gender, race, and rank. This shows the shift in locus of administration even more clearly; prior to 1990, most soldiers who took the HRA did so as part of a physical exam, whereas after 1990, the majority of soldiers to take the HRA did so as part of in-processing to a new assignment. Not surprisingly, this table also shows that younger soldiers are more likely to take the HRA as part of in-processing, and that older soldiers are more likely to take it as part of a routine physical exam (for many years the HRA was a standard part of the cardiovascular screening delivered at the over-40 physical exam).

Table 10. Reason for Taking the HRA by Year and Demographic Characteristics Among First Time Active-Duty Army HRA Takers, 1987-1998

	N	Missing Data (%)	Reason for Taking HRA					
			In-Processing (%)	Periodic Physical Exam (%)	Pre-Physical Fitness Test (%)	Occupa-tional Health Program (%)	Walk-In (%)	Other (%)
Total Sample	407,080	1.2	59.4	18.0	0.7	2.4	3.1	15.2
Year								
1987	183	3.3	11.5	67.8	1.6	0.6	2.2	13.1
1988	41	2.4	0.0	97.6	0.0	0.0	0.0	0.0
1989	74	2.7	1.4	50.0	1.4	6.8	23.0	14.9
1990	3,600	1.5	65.2	14.4	0.5	2.7	4.5	11.1
1991	74,127	1.5	47.0	21.7	0.9	3.5	7.0	18.5
1992	92,148	1.5	54.4	20.2	0.6	2.5	4.1	16.7
1993	59,080	1.2	57.5	17.3	0.6	2.5	3.1	18.0
1994	50,115	0.7	62.1	16.9	0.9	2.1	1.2	16.2
1995	45,306	0.7	61.1	22.3	0.7	2.2	1.0	12.0
1996	36,983	1.6	71.4	14.6	0.5	2.0	0.9	9.0
1997	30,983	0.6	80.8	9.5	0.2	0.9	0.5	7.6
1998	14,435	1.0	72.5	6.8	0.2	0.7	0.8	18.0
Gender								
Male	351,198	1.2	59.5	18.1	0.6	2.3	3.2	15.2
Female	55,124	1.2	58.7	18.1	1.2	2.7	2.7	15.3
Race								
White	254,108	1.1	59.6	18.2	0.6	2.4	3.0	15.3
Black	112,199	1.3	58.5	18.3	0.8	2.5	3.4	15.2
Hispanic	20,659	1.4	64.5	14.7	0.6	1.9	2.8	14.2
Other	19,710	1.5	57.7	18.7	0.8	2.1	3.1	16.2
Age								
<21	64,621	1.0	84.1	3.5	0.3	1.0	2.0	8.2
21-25	131,719	1.0	68.7	9.5	0.5	2.1	3.2	15.0
26-30	80,220	1.0	57.4	18.3	0.6	2.4	3.6	16.8
31-35	56,437	1.0	48.8	25.7	0.6	3.0	3.5	17.4
36-40	45,043	1.7	36.3	36.0	0.9	3.3	3.1	18.7
>40	28,179	2.6	23.8	46.8	1.8	3.8	2.8	18.4
Rank								
E1-E4	213,098	1.0	73.8	7.3	0.5	1.8	3.0	12.6
E5-E9	135,520	1.4	44.7	27.1	0.8	2.8	3.7	19.6
WO[1]	7,681	1.2	34.2	47.8	0.8	2.3	2.3	11.5
O1-O3	31,689	0.8	53.4	23.8	0.7	2.5	2.2	16.7
O4-O5	16,244	2.0	25.1	50.3	1.4	5.5	2.2	13.5
O6-O11	2,535	2.8	10.5	66.4	1.1	6.0	1.3	12.0

[1]Warrant Officer

DOES THE HRA OVERSAMPLE FROM HIGH-RISK POPULATIONS OF SOLDIERS?

Because the HRA is not offered to a random sample of soldiers, it is possible that it may oversample from those who engage in high-risk behaviors. That is, those who

engage in high-risk behaviors and are thus at greater risk for injury might be more likely to be offered the survey by health care personnel or concerned commanders. To check for this we compared the hospitalization histories of HRA takers and nontakers in the year prior to their taking the HRA. We found that even in early years of the survey there did not appear to be large differences in hospitalizations for HRA takers and HRA nontakers. Also noteworthy is the appreciable decline in hospitalizations over time for both groups (see Table 11).

Table 11. Proportions of Active-Duty Army HRA Takers and Nontakers Hospitalized for Any Cause and for Injury in Year Prior to HRA Administration, 1987-1998

Year	HRA Status	N	Any Hospitalization (%)	No Hospitalization (%)	Injury Hospitalization (%)	No Injury Hospitalization (%)
1987	Takers	183	7.1	92.9	1.1	98.9
	Nontakers	739,253	9.8	90.2	1.5	98.5
1988	Takers	41	12.2	87.8	0.0	100.0
	Nontakers	701,873	9.7	90.3	1.4	98.6
1989	Takers	74	9.5	90.5	0.0	100.0
	Nontakers	667,024	10.0	90.0	1.3	98.7
1990	Takers	3,600	10.1	89.9	1.2	98.8
	Nontakers	604,461	9.8	90.2	1.3	98.7
1991	Takers	74,127	9.8	90.2	1.3	98.7
	Nontakers	530,857	9.6	90.4	1.4	98.6
1992	Takers	92,148	9.3	90.7	1.0	99.0
	Nontakers	466,870	9.1	90.9	1.0	99.0
1993	Takers	59,080	10.4	89.6	1.0	990
	Nontakers	371,776	9.5	90.5	1.0	990
1994	Takers	50,115	7.0	93.0	0.7	99.3
	Nontakers	337,074	7.1	92.9	0.8	99.2
1995	Takers	45,306	8.5	97.5	0.3	99.8
	Nontakers	313,202	2.3	97.7	0.2	99.8
1996	Takers	36,983	8.2	91.8	0.7	99.2
	Nontakers	311,422	8.1	91.9	0.8	99.2
1997	Takers	30,983	5.1	94.9	0.6	99.4
	Nontakers	318,161	5.1	94.9	0.6	99.4
1998	Takers	14,435	2.0	98.0	0.4	99.7
	Nontakers	338,880	2.8	97.2	0.3	99.7

Table 12 displays reasons for separation from service among HRA takers and nontakers after 1987. Among soldiers who were discharged after 1989, the most common reason for discharge among both HRA takers and nontakers was expiration of term of service. Soldiers who had completed an HRA appear slightly more likely to have been discharged in order to attend school or to enter an officer commission program. They were also more likely to stay on active duty long enough to attain retirement than were their peers who did not complete an HRA. This is expected since longevity in the Army increases one's opportunities to take the survey.

Table 12. Reason for Discharge Among Active-Duty Army HRA Takers and Nontakers Discharged between 1987-1998

Discharge Reason	**% Takers** (N=231,226)	**% Nontakers** (N=1,143,910)
Unknown/Invalid	0.3	0.2
Expiration of Term of Service	31.7	30.7
Early Release-To Attend School	2.1	0.7
Early Release-Police Duty	0.0*	0.0*
Early Release-Insufficient Retainability	0.1	0.2
Early Release-In the National Interest	3.4	2.5
Early Release-Seasonal Employment	0.0*	0.0*
Early Release-To Teach	0.0	0.0
Early Release-Other (Including RIF/VSI/SSB)	10.4	12.3
Involuntary-Other Reasons (Officer)	0.1	0.1
Conditions Existing Prior to Service	0.2	0.5
Disability-Severance Pay	3.3	2.7
Permanent Disability-Retired	0.4	0.5
Temporary Disability-Retired	0.8	1.0
Disability-Non EPTS-No Severance Pay	0.1	0.2
Disability-Title 10 Retirement	0.0*	0.0*
Unqualified for Active Duty-Other	0.1	3.8
Failure to meet Weight/Body Fat Standards	2.2	1.8
Dependency of Hardship	1.3	1.5
Death: Battle Casualty	0.0	0.0
Death: Non-Battle-Disease	0.0	0.0
Death: Non-Battle–Other	0.3	0.3
Death: Cause Not Specified	0.0	0.0
Officer Commissioning Program	3.5	0.8
Warrant Officer Program	0.0*	0.0*
Service Academy	0.1	0.0
Retirement: 20-30 Years of Service	18.1	9.8
Retirement: Over 30 Years of Service	0.0	0.0
Retirement: Other Categories	3.3	0.8
Failure of Selection for Promotion-Retired (Officer)	0.0	0.0
Character/Behavior Disorder	0.7	1.4
Motivation/Substandard Performance	0.0	0.0
Enuresis	0.0*	0.0*
Inaptitude/Fail Course of Instruction	0.0	0.0
Alcoholism	0.4	0.7
Discreditable Incident	1.5	0.6
Shirking	0.0	0.0
Drugs	0.9	1.7
Financial Irresponsibility	0.0*	0.0*

Discharge Reason	**% Takers** (N=231,226)	**% Nontakers** (N=1,143,910)
Lack of Dependent Support	0.0*	0.0*
Unsanitary Habits	0.0*	0.0*
Civil Court Conviction	0.1	0.1
Security	0.0	0.0
Court Martial	0.2	0.8
Fraudulent Entry	0.0	0.3
AWOL	0.1	0.1
Homosexuality	0.1	0.2
Sexual Perversion	0.0*	0.0*
Good of the Service	1.4	2.9
Juvenile Offender	0.3	0.6
Misconduct/Unsuitability	0.4	1.6
Unfitness/Unacceptable Conduct	0.1	0.1
Unsuitability Unknown	0.1	0.0
Pattern of Disciplinary Infraction	0.1	0.2
Commission of Serious Offense	1.3	1.7
Failure to Meet Qualifications	3.3	3.0
Unsatisfactory Performance	2.4	3.1
Trainee Discharge	0.2	5.2
Failure to Participate (Applies to Reservists)	0.0*	0.0*
Secretarial Authority	0.8	1.0
Erroneous Enlistment or Induction	0.0	0.1
Sole Surviving Family Member	0.0	0.0
Marriage	0.0*	0.0*
Pregnancy	1.2	1.5
Underage (Minor)	0.0*	0.0
Conscientious Objector	0.0	0.0
Parenthood	1.4	1.0
Breach of Contract	0.0	0.1
Other	0.1	0.1
Immediate Reenlistment	0.0	0.0
Dropped from Strength for Desertion	0.3	0.4
Dropped from Strength for Imprisonment	0.4	0.3
Record Correction	0.1	0.2
Dropped from Strength as MIA/POW	0.0*	0.0
Other Dropped from Strength/the Rolls	0.2	0.4

*=Empty Cell

WHICH RESPONDENTS SKIP SENSITIVE QUESTIONS ON THE HRA?

The HRA asks numerous questions that may be considered sensitive (see Table 13). A small proportion (2.6%) of soldiers skipped at least one sensitive item on the HRA and less than 1% of soldiers skipped all of them.

Table 13. Potentially Sensitive Questions on the Army's Health Risk Appraisal and Proportion of Respondents Missing Answers to these Items, 1987-1998 (N=407,080)

Item	Response Options	Percent Missing
27. How many times in the past month did you drive or ride when the driver had perhaps too much alcohol to drink?	Range, 0 – 59	1.2%
28. How many drinks of alcoholic beverages do you have in a typical week?	Range, 0 – 99	1.3%
45. Have you seriously considered suicide within the last two years?	Yes; yes, within last year; yes, within last 2 months; no	0.8%
48. How often has life been so overwhelming in the last year that you seriously considered hurting yourself?	often; sometimes; seldom; never	0.8%
49. In the past year, how often have you experienced repeated or long periods of depression?	often; sometimes; seldom; never	0.8%

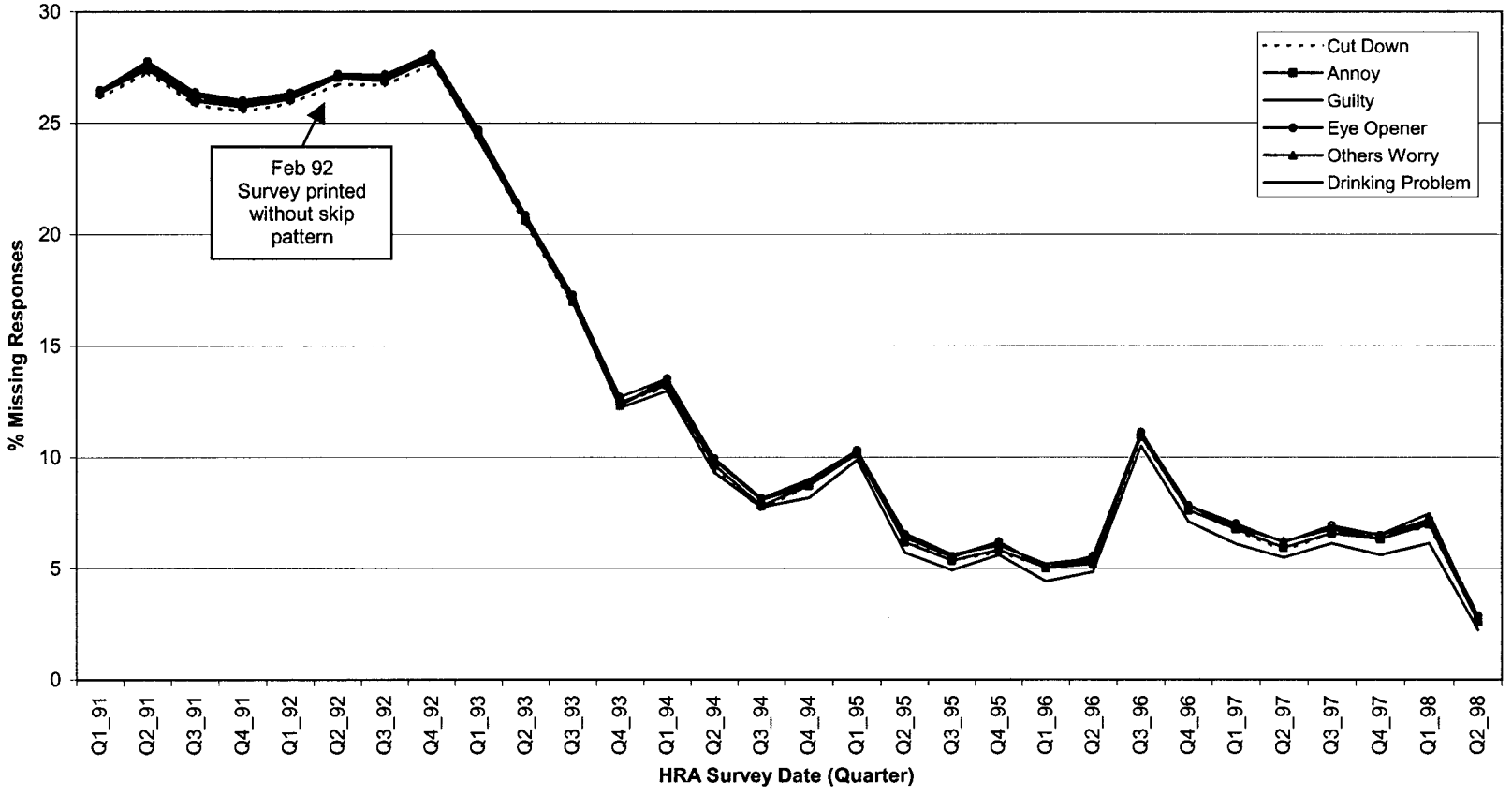
Three percent of all first-time HRA takers skipped all of these items. Table 14 compares the demographic characteristics of first-time HRA takers who skipped one or more items, as compared to all first-time HRA takers. Soldiers who skipped at least one of these items appear to be disproportionately older, officers (particularly O4 and above in rank), minorities, and married, divorced, or widowed.

Table 14. Demographic Profile of Active-Duty HRA Takers Who Skipped at Least One Sensitive HRA Item on the Army's HRA, Compared to All HRA Takers, 1987-1998

	% Takers Who Skipped at Least One Item (N=10,626)	% All Takers (N=407,080)
Gender		
Missing/Unknown	0.1	0.2
Male	86.2	86.3
Female	13.7	13.5
Age		
Missing/Unknown	0.2	0.2
<21	15.8	15.9
21-25	28.8	32.4
26-30	17.2	19.7
31-35	12.2	13.9
36-40	14.0	11.1
>40	11.7	6.9
Grade		
Missing/Unknown	0.0	0.1
E1-E4	50.6	52.4
E5-E9	36.0	33.3
Warrant Officer	2.1	1.9
O1-O3	5.4	7.8
O4-O5	4.9	4.0
O6-O11	1.0	0.6
Race/Ethnicity		
Missing/Unknown	0.1	0.1
White	54.2	62.4
Black	34.4	27.6
Hispanic	5.7	5.1
American Indian/Alaskan Native	0.5	0.6
Asian/Pacific Islander	2.6	2.00
Other	2.5	2.27
Marital Status		
Missing/Unknown	3.9	3.4
Single	41.6	43.9
Married	50.4	48.9
No longer married	4.1	3.8

The HRA was modified in 1992 to delete the skip instruction directing nondrinkers to skip the sensitive items concerning alcohol-related problems. Figure 4 shows the decline, over time, in the proportion of HRA respondents who were missing responses to these items. The decline begins in 1992, when the new survey (without the skip instruction) was initially disseminated and continued quite steeply until 1994, when the decline in missing responses appears to level off.

Figure 4. Proportion of HRA Respondents Missing Responses to Alcohol Items, 1987-1998



It is difficult to discern whether some of the soldiers who skipped sensitive items about alcohol-related problems may in fact have simply been following the skip instructions that directed nondrinkers to skip and which soldiers may have skipped these items because they were reluctant to disclose this information. Table 15 compares the demographic characteristics of all HRA takers to those respondents who were missing responses to more than one of the alcohol-related items. Of particular importance is the fifth column showing the demographic composition of respondents who indicated that they were nonabstainers (that is, they reported consuming at least one drink per week) but nonetheless skipped items 29-34 (the items about alcohol-related problems). These respondents ought to have responded to these items, regardless of which version of the survey they took. Comparing the demographic composition of this group with the demographic composition of all HRA respondents suggests that black soldiers were more likely to avoid answering questions about alcohol-related problems. Nonabstaining respondents who skipped items 29-34 were also slightly more likely to be male or to be aged 21-25.

Table 15. Demographics of Respondents Missing HRA Alcohol Items Compared to the Total Population

		Missing 1 or more responses to items 29-34		
	All HRA Takers (N=401,199)	Missing Drinks/Week (N=2,663)	Reported 0 Drinks/Week (N=69,528)	Reported ≥ 1 Drink/Week (N=3,568)
Gender				
Male	86%	86%	81%	88%
Female	14%	14%	19%	12%
Race				
White	62%	51%	53%	53%
Black	28%	36%	36%	36%
Hispanic	5%	6%	5%	6%
Other	5%	7%	5%	5%
Age				
<21	16%	14%	22%	14%
21-25	32%	22%	26%	34%
26-30	20%	14%	17%	20%
31-35	14%	11%	14%	13%
36-40	11%	20%	12%	12%
>40	7%	19%	8%	7%
Rank				
E1-E4	52%	41%	53%	54%
E5-E9	33%	42%	37%	34%
Warrant Officer	2%	3%	2%	1%
O1-O3	8%	5%	5%	6%
O4-O5	4%	7%	3%	4%
O6-O11	1%	2%	0%	1%

WHICH SOLDIERS REPORT EXTREME VALUES FOR SENSITIVE ITEMS?

Because these items are sensitive in nature and the survey is not administered anonymously, we are also interested in soldiers reporting excessive or extreme values. Tables 16-19 show the demographic profile for soldiers reporting extreme values on the sensitive items listed above in Table 13.

Table 15 shows the demographic profile of soldiers responding in the top 1% of values for the drinking and driving and the drinks consumed per week items. Soldiers in this top percentile reported drinking and driving more than nine times per month and regularly consuming more than 30 drinks per week. The data indicate that compared to other HRA takers, these soldiers are disproportionately male, young (under age 26), enlisted (particularly those of E4 or lower rank), white, and single.

Table 16. Demographic Profile of Active-Duty HRA Takers Responding in the Top 1% for HRA Items Concerning Drinking and Driving and Number of Alcoholic Drinks Consumed Per Week, Compared to All HRA Takers, 1990-1998

	Demographic composition of Takers who are in Top 1% for Drinking and Driving & Number of Drinks per Week (N=942)	**Demographic Composition of All Takers (N=407,080)**
Gender (%)		
Missing/Unknown	0.2	0.2
Male	98.1	86.3
Female	1.7	13.5
Age (%)		
Missing/Unknown	0.1	0.2
<21	21.9	15.9
21-25	57.5	32.4
26-30	11.3	19.7
31-35	4.5	13.9
36-40	3.3	11.1
>40	1.5	6.9
Grade (%)		
Missing/Unknown	0.1	0.1
E1-E4	82.6	52.4
E5-E9	16.6	33.3
Warrant Officer	0.2	1.9
O1-O3	0.1	7.8
O4-O5	0.2	4.0
O6-O11	0.2	0.6
Race/Ethnicity (%)		
Missing/Unknown	0.2	0.1
White	74.8	62.4
Black	19.3	27.6
Hispanic	3.5	5.1
American Indian/Alaskan Native	0.4	0.6
Asian/Pacific Islander	0.5	2.0
Other	1.2	2.3
Marital Status (%)		
Missing/Unknown	1.8	3.4
Single	72.0	43.9
Married	23.4	48.9
No longer married	2.9	3.8

Table 17 shows the demographic characteristics of survey respondents who admitted they had seriously contemplated suicide at some point within the past two years. This group included more female soldiers and more young soldiers (aged 25 and younger). Lower ranking enlisted, white, and single soldiers were also over represented in this group.

Table 17. Demographic Profile of Active-Duty HRA Takers Who Reported Any Level of Suicidal Ideation, Compared to All HRA Takers, 1987-1998

	Demographic Composition of Takers Reporting Any Level of Suicidal Ideation (N=10,642)	Demographic Composition of All Takers (N=407,080)
Gender (%)		
Missing/Unknown	0.3	0.2
Male	83.3	86.3
Female	16.3	13.5
Age (%)		
Missing/Unknown	0.4	0.2
<21	29.5	15.9
21-25	40.6	32.4
26-30	13.5	19.7
31-35	7.6	13.9
36-40	5.7	11.1
>40	2.6	6.9
Grade (%)		
Missing/Unknown	0.3	0.1
E1-E4	76.9	52.4
E5-E9	20.5	33.3
Warrant Officer	0.3	1.9
O1-O3	1.3	7.8
O4-O5	0.8	4.0
O6-O11	0.1	0.6
Race/Ethnicity (%)		
Missing/Unknown	0.3	0.1
White	66.0	62.4
Black	23.6	27.6
Hispanic	5.0	5.1
American Indian/Alaskan Native	0.8	0.6
Asian/Pacific Islander	2.1	2.0
Other	2.2	2.3
Marital Status (%)		
Missing/Unknown	2.7	3.4
Single	60.9	43.9
Married	33.0	48.9
No longer married	3.4	3.8

While women are over represented among active-duty HRA takers who reported contemplating suicide within the past year and within the past two months, the difference in suicidal ideation by gender among HRA takers who had more recently contemplated suicide is less pronounced. The age difference, however, is more pronounced in the latter group, with soldiers under the age of 26 being particularly likely to say they had contemplated suicide within the past two months (see Table 18).

Table 18. Demographic Profile of Active-Duty HRA Takers Reporting Suicidal Ideation Within the Last Year and Within the Last Two Months, Compared to All HRA Takers, 1987-1998

	Demographic Composition of Respondents Reporting Contemplating Suicide Within the Last Year (N=3,478)	Demographic Composition of Respondents Reporting Contemplating Suicide Within the Last Two Months (N=1,652)	Demographic Composition of All Takers (N=407,080)
Gender (%)			
Missing/Unknown	0.35	0.35	0.18
Male	81.5	83.8	86.3
Female	18.1	15.9	13.5
Age (%)			
Missing/Unknown	0.4	0.3	0.2
<21	26.9	29.9	15.9
21-25	39.5	40.4	32.4
26-30	15.6	14.0	19.7
31-35	8.7	7.9	13.9
36-40	6.0	5.7	11.1
>40	3.1	1.8	6.9
Grade (%)			
Missing/Unknown	0.3	0.2	0.1
E1-E4	73.7	77.2	52.4
E5-E9	23.3	20.2	33.3
Warrant Officer	0.4	0.3	1.9
O1-O3	1.7	1.5	7.8
O4-O5	0.7	0.7	4.0
O6-O11	0.1	0.0	0.6
Race/Ethnicity (%)			
Missing/Unknown	0.3	0.2	0.1
White	64.1	65.2	62.4
Black	25.4	25.5	27.6
Hispanic	4.9	4.1	5.1
American Indian/Alaskan Native	0.6	1.0	0.6
Asian/Pacific Islander	2.1	1.9	2.0
Other	2.7	2.1	2.3
Marital Status (%)			
Missing/Unknown	3.3	2.5	3.4
Single	56.7	59.1	43.9
Married	36.2	35.2	48.9
No longer married	3.9	3.2	3.8

Soldiers who said they often found life so overwhelming they had seriously considered hurting themselves and who often experienced long or prolonged periods of depression in the past year were disproportionately younger (under age 26), female, of lower enlisted ranks, American Indian/Alaskan Native and Asian/Pacific Islander, and single (see Table 19).

Table 19. Demographic Profile of Active-Duty HRA Takers Who Report Frequent Bouts of Depression and That Life is Often Overwhelming, Compared to All HRA Takers, 1987-1998

	Demographic Composition of Respondents Reporting Often Feeling Overwhelmed or Depressed (N=1,652)	Demographic Composition of All Takers (N=407,080)
Gender (%)		
Missing/Unknown	0.5	0.2
Male	84.2	86.3
Female	15.3	13.5
Age (%)		
Missing/Unknown	0.6	0.2
<21	29.3	15.9
21-25	41.4	32.4
26-30	13.8	19.7
31-35	7.3	13.9
36-40	5.8	11.1
>40	1.9	6.9
Grade (%)		
Missing/Unknown	0.4	0.1
E1-E4	78.6	52.4
E5-E9	18.5	33.3
Warrant Officer	0.5	1.9
O1-O3	1.6	7.8
O4-O5	0.4	4.0
O6-O11		0.6
Race/Ethnicity (%)		
Missing/Unknown	0.4	0.1
White	61.2	62.4
Black	27.9	27.6
Hispanic	4.8	5.1
American Indian/Alaskan Native	0.9	0.6
Asian/Pacific Islander	2.7	2.0
Other	2.1	2.3
Marital Status (%)		
Missing/Unknown	2.5	3.4
Single	61.0	43.9
Married	33.4	48.9
No longer married	3.1	3.8

Soldiers reporting extreme values for alcohol use were also more likely to express suicidal ideation. Approximately 1.4% of respondents with nonmissing values for alcohol use and suicidal ideation were in the top one percentile for alcohol use on both the drinking and driving exposures (item #27) and the weekly alcohol consumption item (item #28). The odds of also expressing suicidal ideation in this group was almost five times greater than among those reporting lower levels of alcohol use or drunk driving exposures (OR = 4.9, 95% C.I. = 4.45-5.31).

DISCUSSION

Numerous Army researchers have recognized that the HRA database is an invaluable tool in surveillance and research. Other researchers have, however, taken different approaches to various aspects of data cleaning and data management and arrived at widely differing numbers of HRA survey responses available for analysis. A series of reports analyzing the HRA database for the years 1991-1995, for example, found nearly twice as many HRA surveys in each of those years as the number we included in our analyses (11). For example, the 1991 report of their analyses included 135,158 responses (in contrast to our 74,010). Nearly one-third of the women in their 1991 dataset, however, did not specify a military rank, and approximately one-fourth did not specify a military status. While the proportion of women with undeclared rank and military status was particularly high in that year of their analysis, it typically hovered at approximately 20% of women with undeclared rank and 15% of women with undeclared military status. It is possible that many of these survey responses belonged to dependent spouses or Department of the Army civilian employees, and were not unique responses of active-duty Army soldiers. Our analytic efforts improve upon these early reports by taking a more restrictive approach, and although this reduced the number of surveys available for analysis, we can be more certain that the analyses reported herein more accurately reflect the demographic characteristics of HRA respondents who were truly on active duty at the time.

Relatively few HRA surveys were administered prior to 1990. Surveys administered in these early years might best be considered "pilot" surveys. Researchers should use caution in interpreting findings from HRA data prior to 1990 for several reasons. Before 1990 there were significant differences in the composition of HRA takers and nontakers, with those who took an HRA being more likely to be older, married, female, and officers than the Army population at large. After 1990, as the survey became used more widely throughout the Army, the distribution of demographic characteristics of HRA takers and nontakers more closely represents the demographic distribution of the Army as a whole.

An unexpected finding was the trend after 1991 for soldiers with shorter time in service to be more likely to complete an HRA. This persists for the remainder of the years in which we compared HRA takers to nontakers. Similarly, soldiers under age 21 are also slightly over represented after 1990 and they are more likely to be single (never married) and without dependents. This phenomenon could be an artefact of the changes in the administration of the HRA as the program moved from its pilot years to more widespread implementation. Prior to 1989 most HRAs were administered during physical examinations. After 1989, HRAs began to be offered as a routine part of in-processing to new work assignments. It may be that soldiers who were newer to the military (and thus also younger and single) had more opportunities to complete an HRA as they tend to move more frequently through training courses and to new job assignments. Despite a tendency for the HRA to be administered early in a soldier's career, it is nonetheless the case that the likelihood of ever taking the HRA increased as a soldier's time in service increases.

This change in how the HRA was administered after 1989 clearly influenced the characteristics of soldiers selected to take the HRA and thus has an impact on the utility of the HRA data as a research tool. Before 1990 it was offered when soldiers went in for routine physical examinations and perhaps when they were seeking care for a specific health concern. This mechanism of administration resulted in a sampling bias towards older, female, married soldiers. It could have also resulted in a sample of people who were sicker or more concerned about their health, although this does not, fortunately, appear to have been the case. Our analyses showed that HRA takers were not more likely to be discharged from the Army due to health behavior problems such as drug or alcohol abuse. In addition, HRA takers did not appear to be sicker or more prone to injury than their non-HRA taking counterparts (at least with regard to more serious conditions that would result in a hospitalization), even during the early "pilot" years. After 1990, the primary reason for administration of an HRA was via in-processing, and although this tended to slightly oversample from the newer and younger soldiers, it seemed less likely to result in a sample of soldiers biased towards being more ill or health conscious.

Less than 3% of all soldiers skipped at least one of the sensitive items we evaluated from the HRA and only 0.3% skipped all of them. Thus the HRA data are relatively complete, even for potentially sensitive questions. However, a thorough assessment of skip patterns is hampered by changes in the format of the surveys that occurred sometime in 1992. Because the HRA files do not include a variable that clearly indicates which version of the survey was used by the respondent, it is impossible to determine whether a soldier who completed a survey in 1992 and skipped some of the alcohol items was following a skip instruction or was intentionally avoiding answering sensitive items. Figure 4 showed the rapid drop off in missing responses to these sensitive items about alcohol-related problems, with the decrease in proportion of missing responses leveling off in approximately 1994. It may be that by 1994 most of the surveys being offered to soldiers were the later version. If that were true, then nonabstainers who were missing responses on the items about alcohol-related problems from 1994 and later could be assumed to reflect the true proportion and demographic characteristics of soldiers who intentionally avoid answering alcohol-related questions because of the unique sensitivity of this type of information. The fact that black nonabstainers were more likely to skip items 29-34 may suggest that this group, in particular, fears reprisal related to their reported drinking experiences and habits. However, overall, the proportion of the total population who skip any of the alcohol-related items is quite low.

Other changes in the way data have been collected over time also affect the utility of the HRA. It is worth noting that analyses of hospitalization outcomes associated with health behaviors, such as those described on HRA surveys, are complicated by temporal changes in coding practices (2) as well as general declines over time in rates of admissions. There have been changes in the way the Army coded hospitalizations over the past three decades. The Army used ICDA8 from 1971 to 1979, then switched to ICD-9 from 1980 to 1985 and then switched again to ICD-9-CM in 1986/1987. Some of the diagnostic conditions routinely used in later versions of the ICD system did not exist in earlier versions. In addition, physicians have altered their

hospitalization practices over time and their coding habits based on new research and medical guidelines. There have been changes in the way that medical care is managed. Cost containment pressures have resulted in a system of managed care that tends to limit access to medical care providers and that favors treating patients on an outpatient basis in order to avoid costly hospitalizations. Hospitalizations in both military and civilian hospitals have declined over the past 30 years (1, 2, 4, 8). This phenomenon is the likely result of a combination of factors, including changes in admission practices (such as relegation of less severely ill patients to outpatient care), changes in safety and health practices, and demographic changes in the Army population over time. Regardless of the reasons for these changes it is important that researchers conducting trend analyses be cognizant of these issues and account for them properly in their analyses.

In spite of the fact that the HRA survey is not given anonymously, some soldiers are reporting extreme levels of alcohol use and risky alcohol-related behavior. Our study found that 942 soldiers reported consuming more than 30 drinks per week and drinking and driving (or riding with a drunken driver) nine times within the past month. It is possible that these soldiers were exhibiting a form of help-seeking behavior because they knew a medical professional would review their scores. The fact that the extreme alcohol responses also correlates with a positive response on one of the suicidal ideation items lends further evidence that this may be the case. On the other hand, because the HRA survey item on weekly alcohol consumption limits possible responses to 0-99 (as opposed to offering an open-ended response option), it is possible that these more extreme values represent true behaviors. For example, young, white males of lower rank were most likely to report extreme values on the drinks per week and drinking and driving scales. Other studies have indicated that this group tends to include more heavy drinkers and risk takers (3, 6, 7). Perhaps they truly are consuming this much alcohol per week or more. Because the response option is limited to 99 we cannot be sure what the true upper range for this value might be.

CONCLUSIONS

The HRA may be a useful research tool for the study of health behaviors among active duty Army soldiers. The survey was offered for more than a decade, which presents an opportunity to analyze trends in risk factors and health behaviors and how they may impact health outcomes. Furthermore, because some soldiers were surveyed more than once during their military careers, longitudinal evaluation of behavior change and subsequent effects on health outcomes may be evaluated. Though the HRA was not administered to a random sample of soldiers, there does not appear to be any oversampling of soldiers who were more or less sick among HRA takers and nontakers. There is relatively little missing data, even for potentially sensitive questions. While not given anonymously, the HRA does elicit a wide range of responses.

While the strengths and possible uses of the HRA are numerous, these data should not be used without careful consideration of several challenges involved in understanding and using HRA data and limitations to the interpretation and generalizability of findings.

First, the HRA database include numerous duplicate and near duplicate records for individual soldiers completing a survey. In addition, the common practice of using an active duty sponsor's SSN when a dependent completed the HRA makes it necessary to carefully evaluate each survey to determine first whether the respondent is in fact an active duty servicemember (as opposed to one of his or her dependents) and second to determine whether the survey is a duplicate or near duplicate resulting from a repeat scan of the original survey.

Second, researchers who use HRA data must understand that the mechanism by which HRAs were administered was nonrandom and oversampled from some demographic subgroups, and that this oversampling varied from year to year. This was particularly apparent for the first two or three years during which the HRA was administered. It would probably be prudent to consider HRAs administered prior to 1990 as "pilot" surveys, and to use only HRAs administered in 1990 or later in epidemiologic research.

Third, though there is relatively missing data, minority soldiers appear most likely to skip sensitive items on the survey. There is also a slight over representation of males and soldiers age 21-25.

RECOMMENDATIONS

Health behavior surveys are a useful tool not only from a clinical screening perspective but also as part of a comprehensive health surveillance and research program. However, several changes would make the HRA a more useful instrument.

- The HRA or a similar health behavior-screening instrument should be offered routinely and on a random basis to all soldiers.
- There needs to be greater investigation into the reliability and validity of HRA survey responses.
- The disproportionate number of higher ranking, older, and minority officers who skip sensitive items should be explored, perhaps through focus groups. Anecdotal accounts suggest that soldiers who have been in the military system for a long time may learn to avoid reporting any information that might affect their promotability. Younger, lower ranking soldiers may not have learned this "lesson" by the time they take the HRA.
- Individuals and demographic subgroups reporting extreme values on high-risk behaviors and experiences should receive more focused attention from researchers and perhaps interventionists.
- The HRA is being phased out and replaced by the new Health Evaluation and Assessment Review (HEAR) survey. The HEAR should receive early evaluation in terms of its reliability and validity. Adjustments should be made early on to ensure adequate sampling of all Army demographic subgroups. Efforts should be made to avoid the challenges in parceling out the true identities of the survey-

takers (i.e., sorting out whether person is an active duty servicemember or family member, sorting out whether it is an original survey or duplicate).

- Surveys of alcohol consumption should not truncate response options or should at least allow for a more generous range of self-reported drinking. In addition, the HRA alcohol use item only asks about weekly drinking quantity but does not address frequency. We do not know whether the weekly drinking reported by respondents is equally spread over seven days or whether the respondent did most of his or her drinking on the weekend. It also lacks an item assessing episodic heavy drinking, or so-called binge drinking, which has been linked with particular adverse health and social outcomes. Future surveys need to improve upon these deficiencies in the alcohol items on the HRA survey.

- Finally, responses indicative of high risk for mental or physical health problems should receive prompt attention from an appropriately trained care provider.

- Trained survey experts should be consulted at all phases of development for all DoD survey projects. This is essential not only during the creation of the survey, but during pilot testing and implementation as well as interpretation of data.

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APPENDIX A: THE ARMY'S HEALTH RISK APPRAISAL (HRA) QUESTIONNAIRE

Appendix D

Bell NS, Amoroso PJ, Williams JO, Yore MM, Engel CC, Senier L, DeMattos AC, Wegman DH. Demographic, physical, and mental health factors associated with deployment of U.S. Army soldiers to the Persian Gulf. Mil Med 2000;165(10):762-72.

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Demographic, Physical, and Mental Health Factors Associated with Deployment of U.S. Army Soldiers to the Persian Gulf

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A total of 675,626 active duty Army soldiers who were known to be at risk for deployment to the Persian Gulf were followed from 1980 through the Persian Gulf War. Hospitalization histories for the entire cohort and Health Risk Appraisal surveys for a subset of 374 soldiers were used to evaluate prewar distress, health, and behaviors. Deployers were less likely to have had any prewar hospitalizations or hospitalization for a condition commonly reported among Gulf War veterans or to report experiences of depression/suicidal ideation. Deployers reported greater satisfaction with life and relationships but displayed greater tendencies toward risk-taking, such as drunk driving, speeding, and failure to wear safety belts. Deployed veterans were more likely to receive hazardous duty pay and to be hospitalized for an injury than nondeployed Gulf War-era veterans. If distress is a predictor of postwar morbidity, it is likely attributable to experiences occurring during or after the war and not related to prewar exposures or health status. Postwar excess injury risk may be explained in part by a propensity for greater risk-taking, which was evident before and persisted throughout the war.

Introduction

Nearly 700,000 American military personnel were deployed to the Persian Gulf between August 1990 and April 1991 in support of Operations Desert Shield/Desert Storm (ODS/DS), most of them Army soldiers. Soon after these soldiers began returning to the United States, reports of unexplained illnesses and nonspecific symptoms (later termed "Gulf War illnesses") began to surface. After nearly 10 years of research and a great deal of media attention, the cause of these problems remains elusive.

One potential, although largely unexplored, explanation for the development of Gulf War-related illnesses is the possibility that prewar characteristics (intrinsic or acquired traits) shared by soldiers deployed to the Persian Gulf differ from those of soldiers not deployed. Understanding of these differences may contribute to an improved understanding of why a variety of symptom complexes described as Gulf War-related illnesses have been reported among those soldiers who did ultimately deploy to the Persian Gulf. At a minimum, the potential confounding influence of these possible differences deserves a comprehensive evaluation in current research efforts.

The purpose of this paper is to describe the prewar demographic, occupational, and physical and mental health status of active duty Army soldiers who deployed to the Persian Gulf and to compare these characteristics with those of soldiers on active duty who did not deploy.

Background

Studies of Gulf War veterans have focused principally on postwar health outcomes. Few studies have compared the prewar experiences, health habits, and general mental and physical health status of veterans. Most significantly, few studies have explored how factors predicting deployment may confound or contribute to soldiers' risk of developing Gulf War-related illnesses subsequent to service in the Persian Gulf. Documenting differences between soldiers based on whether they deployed or not may improve understanding of postdeployment soldier health.

Differences in demographic variables, health behaviors, risk-taking behaviors, and mental or physical health could influence a soldier's postwar health status. Such factors could affect the chance of selection for deployment (e.g., risk-taking habits), the risk of future illness independent of deployment (e.g., cigarette smoking), and the risk of responding to the deployment experience with increased risk-taking behaviors (e.g., postwar increases in alcohol use as a coping response).

During ODS/DS, deployed soldiers did not experience significantly higher overall mortality rates than nondeployed Gulf War-era veterans or the U.S. population at large, with the exception of unintentional injury death.[1] Similarly, a study of postwar mortality found that deployed Gulf War veterans were significantly more likely to die from accidents, such as motor vehicle crashes, than their nondeployed counterparts, but not from illness-related deaths.[2] This suggests either risk-taking differences between deployed and nondeployed soldiers during and after the war or increased exposure to hazards. Because a veteran's experiences during the war might contribute to the adoption of unhealthy risk-taking behaviors after the war, it is important to look for the presence of these behaviors before deployment. Otherwise, we will not be able to discern whether the war caused increases in risk-taking or whether prewar tendencies to engage in risky behaviors were in fact responsible for deployment. Similarly, suggestions that stressors or distress after service in the Persian Gulf may predict Gulf War illnesses

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cannot be fully evaluated without exploration of mental health or experiences of stressors before deployment.

Studies published to date have primarily measured health outcomes among individuals assigned to one or more specialized military units, often relying on small samples,[3-13] among groups of veterans seeking treatment for conditions they believed to be related to service in the Persian Gulf,[10,14-16] or among veteran populations drawn from a particular geographic locale.[7,10,17-22] Many studies relied heavily on self-reports of symptoms and exposures, sometimes with little obvious effort to validate the reports or the measurement instrument used.[7,9-13,17-22] Premorbid data on the physical and mental health status of Gulf War veterans is severely limited. There have been few population-based surveys that have examined health-related trends across the entire Army or that have been able to control for a large enough number of demographic variables to adequately assess the issue of who gets selected to deploy. This has resulted in an incomplete and potentially biased picture of the functional health status of Army Gulf War veterans and has prevented a cogent assessment of the extent to which prewar factors affect a soldier's risk of developing Gulf War-related illnesses.

This paper expands upon existing knowledge by examining a broader range of prewar health status measures for all Army soldiers on active duty during the war, followed over a longer continuous prewar period. Also, this paper focuses specifically on the Army, a group known to be disproportionately high users of care for Gulf War health concerns.[23] This study includes prospectively gathered information on a variety of mental health and risk-taking behavior measures.

Methods

Study Population

A total of 675,626 active duty Army soldiers were followed from 1980, or entry to the Army if they entered after 1980, to the beginning of ODS/DS (August 1990). Approximately 38% (N = 257,699) of these soldiers ultimately were deployed to the Persian Gulf at some time between August 1, 1990, and June 14, 1991. Although a total of 836,438 soldiers were on active duty in the U.S. Army during some portion of the Gulf War, only soldiers who remained on active duty for the full duration of ODS/DS (i.e., active duty subjects, for whom we had confirmed demographic information at three observation dates: June 1990, December 1990, and June 1991) were included in the study cohort. Out of these 836,438 soldiers, there were 160,812 who were on active duty during some portion of ODS/DS but not for the entire period, 7.5% of whom (N = 12,098) were deployed to the Persian Gulf. Because these individuals did not have the same opportunity to be deployed and were often missing prewar information, they were not included in the study population. A subanalysis of 374 members of the study population who took an Army Health Risk Appraisal (HRA) before the war began was conducted to assess differences in prewar risk-taking, self-reported experiences of stressors, and feelings related to distress or depression.

The Data

The Total Army Injury and Health Outcomes Database (TAIHOD)[24,25] was used to describe the study population's demographic, health, and behavioral characteristics. The TAIHOD joins key elements from multiple Department of Defense (DoD) administrative and health databases, linked at the individual soldier level by encrypted Social Security numbers. Components used in these analyses included demographic and occupational records, self-reported health behaviors and quality of life (HRA surveys), hospitalizations, and health evaluations from the Comprehensive Clinical Evaluation Program for Gulf War veterans (CCEP[a]).[24,25]

The TAIHOD Defense Manpower Data Center data are collected at 6-month intervals, in June and December of each year. Discharge ("loss") files are merged to these files to provide a complete occupational history for every active duty soldier. HRAs, officially implemented by the Army in 1987 but not administered in large numbers until 1991, have been administered to a subset of the Army during routine in-processing to new work assignments, as part of periodic physical examinations or physical fitness testing, or during walk-in visits to occupational or outpatient health clinics. Sociodemographic characteristics of individuals taking the HRA were similar to those of individuals in the study population who did not take an HRA, except that HRA takers were more likely to have some education beyond high school than were those in the overall cohort (38% versus 19%, respectively). Also, enlisted soldiers who had completed an HRA were more senior than enlisted soldiers who did not complete an HRA (50% of HRA takers were E5 or above versus about 40% of those who did not take an HRA). These differences probably reflect, in part, longer time in the Army and thus greater opportunity to have been offered the HRA. Although 13% of the overall study cohort had been in the Army for 1 year or less in June 1990, only 6% of those taking the HRA had been in the service for 1 year or less. Perhaps more importantly, though, those taking the HRA were no more likely to have had a previous hospitalization than those who did not take an HRA, suggesting similar health status (data not shown).

Variables for Analysis

The main outcome measure for these analyses is deployment to the Persian Gulf. The DMDC Gulf War deployment file was used to determine if a soldier was deployed to the Gulf War theater of operations. For this analysis, deployment was defined by being sent to the Gulf War theater at any time between August 1, 1990, and June 14, 1991.

Demographic Data

Demographic information included gender, age, race, education, marital status, number of dependents, rank, total active duty service, and occupation (DoD occupational code). Demographic data from the June 1990 DMDC files were used for most analyses. For logistic regression models of prewar annual hospitalization risks, demographic data from the first observation point in each year were used.

For ease of analysis and interpretation, age is grouped as younger than 21, 21 to 25, 26 to 30, 31 to 35, 36 to 40, and older than 40 years of age. Racial or ethnic groups are described as

[a]The CCEP was established in June 1994, upon the directive of the Department of Defense, to evaluate Gulf War veterans who were concerned about their health and to facilitate treatment for the myriad complaints and conditions experienced by Gulf War veterans.

white, black, Hispanic, Asian/Pacific Islander, Alaskan/Indian, and other. Education is coded as less than a high school degree, high school degree or equivalent (GED), some college, bachelor's degree, any graduate education, and other. Marital status is coded as single (never married), no longer married, married with spouse not on active duty, married with spouse on active duty but not deployed to the Persian Gulf, and married with spouse on active duty and deployed to the Persian Gulf. Dependent status is coded as member only, member with one dependent, and member with two or more dependents. Military rank is coded as junior enlisted (E1–E4), senior enlisted (E5–E9), warrant officers, junior officers (O1–O3), officers (O4–O5), and senior officers (O6–O11). Total time on active duty was calculated from entry into the service until June 1990 and grouped as follows: less than 6 months, more than 6 to 12 months, more than 12 to 24 months (1–2 years), more than 24 to 60 months (2–5 years), more than 60 to 120 months (5–10 years), more than 120 to 180 months (10–15 years), more than 180 to 240 months (15–20 years), and more than 240 months (more than 20 years).

Some soldiers receive hazardous duty pay as partial compensation for their occupational exposures. Hazardous duty pay is received by flight crew, parachutists, divers, those assigned to war zones (combat pay) or foreign duty, and those exposed to environmental stressors or experimental vaccines. Hazardous duty has been linked in previous research to increased risk of injury.[26] For this study, hazardous duty pay was coded as follows: not receiving hazardous duty pay, receiving one type of hazardous duty pay only, and receiving two or more types of hazardous duty pay concurrently between January 1 and June 30, 1990. Thus, hazardous duty compensation received in this period reflects exposures before ODS/DS.

Occupations were grouped using the DoD occupational codes.[b] DoD occupational codes are broad occupational categories composed of similar military occupational specialties. Occupational specialties available differ by rank and often by gender. The categories for enlisted personnel include infantry/gun crews, electrical equipment repair, communications/intelligence, health care, technical/allied specialists, support/administration, mechanical equipment repair, crafts workers, service/supply, and nonoccupational. Warrant and commissioned officer categories include general officer/executive, tactical operations officer, intelligence officer, engineering and maintenance officer, scientists and professionals, health care officers, administrators, supply/procurement and allied officers, and nonoccupational.

Health and Health Behaviors

The hospital and HRA components of the TAIHOD were used to document prewar health status. Hospitalizations were examined in three overlapping categories: any cause, injuries (International Classification of Diseases, 9th Revision, Clinical Modification codes 800–999), and conditions most commonly observed among Army Gulf War veterans evaluated for Gulf War-related health concerns.[c] Although there is no clear consensus from the medical community on what constitutes a Gulf War illness, to evaluate the incidence of prewar conditions commonly diagnosed among veterans of the war we used the 25 most frequent ICD-9-CM diagnoses (other than "healthy") among Army veterans registered with the CCEP who received a clinical evaluation. These Gulf War-prevalent illnesses are referred to as Gulf War illnesses (GWI) throughout this text. Hospitalization with a primary diagnosis including any of these conditions was used to indicate a GWI hospitalization independent of deployment status. Any hospitalization occurring before August 1, 1990, was included for analysis, with the earliest hospitalization cases occurring in 1980. For purposes of these descriptive analyses, hospitalizations were counted once per individual in each of the three categories.

Stressors, distress, risk-taking propensity, and general mental well-being were assessed through several HRA variables. We grouped six variables assessing behavioral risk for alcohol dependence into one single index measure because intercorrelations were quite high (coefficient $\alpha = 0.763$) and all of the items appear to measure risk for dependent drinking (face validity). The resultant composite alcohol use measure comprised the four CAGE items[27] and two additional, similarly scaled items: "friends worry about your drinking" and "ever have a drinking problem." The CAGE is a clinical screening tool used to identify individuals at risk for alcohol dependency. Thus, we refer to the composite variable (CAGE plus the two related items) as a potential "dependent drinking" measure. This composite item has been shown to be a better predictor of high-risk drinking and other risky behaviors than the CAGE alone.[28] Survey takers missing responses to three or more of the items were excluded (18%). The remaining items were used to develop an average response. These responses were dichotomized, based on the distribution of responses for the entire population, into two categories: those with no affirmative responses (84%) versus those with one or more affirmative responses. Risky driving practices were also grouped to improve power and because any one of the three high-risk driving habits measured in the HRA could increase the risk for motor vehicle injuries—the only source of differences in mortality between Gulf War-era veterans who were deployed versus those not deployed to the Persian Gulf.[2,29] This variable included drinking alcohol before driving or riding with someone who had been drinking, speeding, and seatbelt use. Very few soldiers were missing responses to any of these items ($N = 6$). Those who were missing responses to any of these items were excluded from the analysis. The final variable was coded as yes if the subject said he or she had done any drinking and driving or had ridden with an intoxicated driver one or more times in the past month, if he or she routinely drove more than 5 miles per hour over the speed limit, or if he or she reported using a safety belt less than 100% of the time on average.

[b]DoD 1312.1-I, Occupational Conversion Index. Enlisted/Officer/Civilian, March 1997.

[c]Major depressive disorder, single episode (296.20); neurotic depression (300.4); tension headache (307.81); prolonged post-traumatic stress disorder (309.81); depressive disorder, not elsewhere classified (311); migraine, unspecified (346.90); essential hypertension, unspecified (401.90); allergic rhinitis, cause unspecified (477.9); asthma, unspecified (493.90); esophageal reflux, without inflammation (530.81); irritable colon, not elsewhere specified (564.1); contact dermatitis and other eczema, unspecified cause (692.9); primary localized osteoarthrosis (715.18); osteoarthrosis, unspecified whether generalized or localized (715.90); unspecified arthralgia (719.40); lower leg arthralgia (719.46); multiple-site arthralgia (719.49); lumbago, not otherwise specified (724.2); myalgia and myositis, unspecified (729.1); other insomnia (not otherwise characterized) (780.52); other and unspecified sleep apnea (780.57); malaise and fatigue (780.7); other general symptoms, which may include amnesia (retrograde), chills not otherwise specified, generalized pain, and hypothermia not related to low environmental temperature (780.9); rash and other nonspecific skin eruptions (782.1); and headache, including facial pain and other pain in the head that is not otherwise specified (784.0) (TAIHOD, May 1999).

Other variables used for analysis included feeling so overwhelmed the respondent had considered hurting himself or herself, considering suicide or experiencing prolonged depression within the past year, experiencing worries that interfered with life, problems with spouse, children, or peers, work stress, low satisfaction in current job assignment, low life satisfaction, frequent losses in the past year, and little time for relaxation. We also included self-reported daily tobacco use and weekly alcohol consumption.

Analytic Methods

Exploratory analysis was conducted using frequency distributions and χ^2 tests. Continuous variables were compared using t tests. To compare prewar differences in health behaviors and experiences of stressors and distress between deployed and nondeployed cohorts, χ^2 analysis was used. Multiple logistic regression analyses, with deployment as an outcome, were conducted to explore the relationships between the explanatory variables. Occupation, gender, and rank were highly correlated. Therefore, we constructed different models, selecting the most commonly deployed occupational groups in each gender-rank group for comparison purposes.

To compare differences between deployed and nondeployed cohorts in their risk for hospitalization before the war while controlling for differences in exposure potential (time in service), multivariate Cox proportional hazard models were used. Soldiers were followed from entry into the Army (or from January 1, 1980, for those who entered the Army before 1980) until their first hospitalization event occurred or until August 1, 1990 (censored date). In 1990, only hospitalizations occurring before August 1 were included for comparison, because this was 1 day before Iraq's invasion of Kuwait and 1 week before the arrival of U.S. planes in Saudi Arabia. Thus, we hoped to reduce potential bias that might result if an individual sought hospitalization to avoid deployment.

To identify changes in risk for hospitalization as a function of time and proximity to the deployment period, logistic regression models predicting hospitalization for any cause, for injuries, and for GWI were also constructed for each year in the prewar period. Beginning in 1980, models compared rates in each year for soldiers who ultimately deployed with rates for those who did not deploy. The potentially confounding influences of gender, age, race/ethnicity, time in active military service, education, and rank were included in the models.

SAS was used to develop multivariate models and initial exploratory models.[30] Bivariate associations between self-reports on the HRA and deployment status were evaluated using EpiInfo.[31] Exact odds ratios, confidence intervals, and two-sided p values were used, because many of the tables included sparse cells.

Results

There were 675,626 Army soldiers on continuous active duty during ODS/DS. Thirty-eight percent (257,699) were deployed to the Persian Gulf between August 1, 1990, and June 1, 1991.

Unadjusted analyses revealed that deployers were more likely to be male, have fewer than 5 years of time in service, be younger than 25 years of age, black, single, and high school graduates, have fewer dependents, and be junior enlisted and junior officer rank than their nondeployed counterparts (Table I). Thirty-nine percent of men on active duty during the war deployed compared with 29% of women on active duty; 46% of those younger than 21 years deployed compared with 28% of those older than 35 years; and almost half of those enlisted with a grade of E1 to E4 (45%) deployed compared with 10% of officers with a grade of O6 to O11 (data not shown).

Deployers were also more likely to have received hazardous duty pay before July 1990 (Table I). Deployed enlisted soldiers were more likely to be in infantry/gun crews, mechanical equipment repair, or crafts worker (e.g., plumbers, metal workers) occupations. Deployed officers were significantly more likely to belong to the tactical operations or supply and procurement, engineering and maintenance, or intelligence officer occupational group. Deployed warrant officers were significantly more likely to be in the tactical operations occupational group.

Table II shows whether the demographic characteristics described in Table I are independent predictors of deployment in multivariate logistic regression models. Because gender, rank, and occupation are highly correlated (with numerous potential occupational categories), we conducted separate subanalyses based on occupations most commonly deployed to the Persian Gulf within each gender-rank group. The results from these multivariate logistic regression models show factors explaining variation among those who deployed and those who did not deploy in occupations with the highest rates of deployment to the Persian Gulf.

Factors consistently associated with deployment across all four occupations included younger age (mostly younger than 25 years), less time in service (particularly those in the service less than 5 years), having fewer than two dependents, and having a spouse on active duty who was also deployed to the Persian Gulf. Also, those with less education were more likely than their more highly educated counterparts to deploy. Enlisted male and female soldiers of lower rank were significantly more likely to be deployed than their higher-ranking counterparts. This was also true of female officers but not male officers. Male enlisted and male officers with special pay for exposure to two or more occupational hazards were more likely to deploy than males in these same occupations who had received no hazardous duty pay.

Three hundred seventy-four of the 675,626 soldiers on active duty during ODS/DS had taken an HRA before August 1, 1990. Deployers were less likely to have seriously contemplated suicide or to have experienced prolonged or repeated periods of depression within the past year (Table III). They were less likely to say that life had been so overwhelming that they had considered hurting themselves, that worries had ever interfered with their daily lives, that they were not satisfied with their lives or jobs, that they had experienced family problems or personal misfortunes, or that they never had time to relax. They were also less likely to answer affirmatively to the dependent drinking measure. Similarly, those who deployed were more likely to say that they had experienced a pleasant life change in the past year. Although the direction of these associations is consistent, we are unable to rule out the role of chance in these associations because of small sample sizes and tight control of type I and II errors.

A trend was observed suggesting that those who deployed are

TABLE I

UNADJUSTED ASSOCIATIONS BETWEEN THE DEMOGRAPHIC CHARACTERISTICS OF 675,626 ARMY GULF WAR-ERA VETERANS AND DEPLOYMENT TO THE PERSIAN GULF

	Deployed (N = 257,699)	Not Deployed (N = 417,927)	χ^2 p Values
Gender			<0.001
Male	91.64%	87.12%	
Female	8.36%	12.88%	
Age[a]			<0.001
<21 years	15.04%	11.07%	
21–25 years	37.15%	28.09%	
26–30 years	22.58%	21.94%	
31–35 years	13.56%	17.64%	
36–40 years	7.92%	12.50%	
>40 years	3.75%	8.73%	
Race/ethnicity			<0.001
White	60.85%	62.82%	
Black	30.67%	28.63%	
Hispanic	4.15%	3.96%	
Asian/Pacific Island	1.43%	1.82%	
Indian/Alaskan	0.56%	0.50%	
Other	2.32%	2.24%	
Educational level			<0.001
Less than high school	1.21%	0.89%	
High school graduate/GED	84.35%	75.29%	
Alternative education	0.03%	0.03%	
Some college	3.43%	4.94%	
Bachelor's degree	7.75%	10.98%	
Graduate degree	2.10%	6.67%	
Unknown	1.13%	1.22%	
Marital status			<0.001
Single	43.31%	34.00%	
Married, spouse not on active duty	49.93%	56.98%	
Married, spouse on active duty and deployed	1.95%	0.95%	
Married, spouse on active duty and not deployed	1.57%	3.65%	
No longer married	3.20%	4.27%	
Unknown	0.03%	0.15%	
Dependents			<0.001
Member only	44.93%	36.65%	
Member plus one dependent	17.57%	17.50%	
Member plus two or more dependents	37.32%	45.56%	
Unknown	0.19%	0.29%	
Rank			<0.001
E1–E4	54.39%	41.33%	
E5–E9	34.92%	41.41%	
Warrant officer	2.20%	1.95%	
O1–O3	6.53%	9.08%	
O4–O5	1.77%	5.26%	
O6–O11	0.18%	0.97%	
Time in Service			<0.001
Less than 6 months	3.99%	4.50%	
6–12 months	10.94%	7.89%	
>12–24 months	16.31%	10.88%	
>24–60 months	31.71%	26.20%	
>60–120 months	18.34%	20.13%	
>120–180 months	11.10%	15.59%	
>180–240 months	6.31%	11.27%	
>240 months	1.26%	3.49%	
Unknown	0.03%	0.05%	

Values are those documented in June 1990 DMDC records.

[a] χ^2 test for trend analysis indicated a statistically significant trend of increasing risk for deployment with successively younger age groups, with the odds for deployment being more than three times greater among those younger than 21 years than for those older than 40 ($p < 0.001$).

TABLE I CONTINUED

	Deployed (N = 257, 699)	Not Deployed (N = 417,927)	χ^2 *p* Values
Hazardous duty pay			<0.001
No hazardous duty pay	86.41%	87.08%	
Hazardous duty pay one type	12.81%	12.37%	
Hazardous duty pay two or more types in pay period	0.78%	0.55%	
Enlisted (*n* = 575,942)			<0.001
Infantry/gun crews	27.58%	24.34%	
Mechanical equipment repair	18.99%	13.38%	
Communication/intelligence	14.01%	14.13%	
Support/administration	12.17%	18.26%	
Service/supply	11.76%	11.15%	
Health care	5.09%	8.24%	
Electrical equipment repair	4.60%	5.29%	
Technical/allied specialist	2.93%	2.96%	
Craftsworkers	2.61%	1.77%	
Nonoccupational	0.25%	0.44%	
Other	0.01%	0.03%	
Officer (*n* = 85,874)			<0.001
Tactical operations officer	40.86%	27.02%	
Nonoccupational	12.10%	19.06%	
Health care officers	12.10%	18.91%	
Supply, procurement, and allied officers	10.37%	7.11%	
Engineering and maintenance officer	10.35%	8.54%	
Intelligence officer	5.24%	4.50%	
Administrators	4.90%	7.40%	
Scientists and professionals	3.78%	6.79%	
General officer/executive	0.26%	0.52%	
Other	0.05%	0.15%	
Warrant (*n* = 13,810)			<0.001
Tactical operations officer	49.09%	37.77%	
Engineering and maintenance officer	26.44%	25.37%	
Supply, procurement, and allied officers	7.76%	7.42%	
Nonoccupational	4.91%	6.31%	
Intelligence officer	4.38%	7.34%	
Health care officers	3.77%	3.75%	
Administrators	3.49%	11.28%	
Scientists and professionals	0.14%	0.64%	
Other	0.02%	0.12%	

more likely to engage in risky behaviors, such as drinking alcohol before driving, speeding, and not wearing seatbelts while driving.

In multivariate Cox proportional hazards models (controlling for gender, age, race, education, marital status, time in service, rank, and prewar receipt of hazardous duty pay), deployed status remained significantly associated with reduced risk for hospitalization for any cause or for one of the conditions commonly documented among Gulf War veterans, although the risk differences were quite small. There was no significant difference in risk of injury hospitalization between deployed and nondeployed Gulf War-era veterans. Male gender, young age, less education, single marital status, less time in service, and receipt of two or more types of hazardous duty pay in a pay period were all significant predictors of prewar injury hospitalization (data not shown).

Figures 1 to 3 depict the association between deployment and adjusted odds of hospitalization during each year of the follow-up period. Figure 1 shows that deployers were at lower risk for hospitalizations for any cause, particularly in the period immediately before ODS/DS, even after controlling for gender, age, race/ethnicity, time on active duty, education, and rank.

Deployed soldiers were not at greater risk for a prewar GWI hospitalization than nondeployed Gulf War-era veterans. There was a largely consistent pattern of risk in the prewar period where those who ultimately deployed were actually at lower risk for a hospitalization related to any of the diagnoses most commonly seen among veterans seeking care for GWI after the war (Fig. 2).

In most years before ODS/DS, deployers were at greater risk for an injury hospitalization than were their nondeployed counterparts. This was true even after accounting for the effects of gender, age, race, time in service, education, and rank (Fig. 3). To refine this analysis, we also constructed an age-specific model including just soldiers younger than 26 years. Even among this very young cohort, injury risk in almost every year before ODS/DS was significantly higher among soldiers who ultimately deployed than among those who did not (data not shown).

Discussion

Without good prewar baseline information, it is difficult to make a cogent assessment regarding the postwar health conse-

TABLE II

MULTIVARIATE LOGISTIC REGRESSION ANALYSES OF INDIVIDUAL CHARACTERISTICS RELATED TO DEPLOYMENT TO THE PERSIAN GULF BY OCCUPATION, RANK, AND GENDER GROUPS MOST OFTEN DEPLOYED TO THE PERSIAN GULF

	Infantry and Gun Crews (N = 146,864) (Male Enlisted)	Support and Administration (N = 25,248) (Female Enlisted)	Tactical Operations (N = 31,427) (Male Officer)	Health Care (N = 4,566) (Female Officer)
Age				
17–20 years	2.5 (2.3–2.7)	2.8 (2.2–3.5)	3.0 (0.9–9.4)	NA[a]
21–25 years	2.4 (2.3–2.6)	2.3 (1.8–2.8)	4.3 (3.9–4.7)	2.1 (1.6–2.7)
26–30 years	1.8 (1.6–1.9)	1.9 (1.5–2.4)	3.3 (3.1–3.6)	1.4 (1.1–1.8)
31–35 years	1.4 (1.3–1.5)	1.5 (1.2–1.8)	2.0 (1.8–2.1)	1.3 (1.0–1.7)
36–40 years	1.2 (1.1–1.3)	1.1 (0.9–1.4)	1.9 (1.7–2.1)	1.0 (0.8–1.3)
>41 years	1.0	1.0	1.0	1.0
Race/ethnicity				
White	1.0	1.0	1.0	1.0
Black	1.0 (1.0–1.0)	1.1 (1.1–1.2)	0.9 (0.8–1.0)	0.9 (0.7–1.2)
Hispanic	1.0 (0.9–1.0)	1.3 (1.1–1.5)	0.8 (0.7–1.0)	1.0 (0.5–1.9)
Indian/Alaskan	1.0 (0.9–1.2)	1.1 (0.8–1.6)	1.1 (0.8–1.6)	0.7 (0.2–3.2)
Asian/Pacific Islander	0.9 (0.8–1.0)	0.8 (0.7–1.0)	0.8 (0.6–1.0)	0.7 (0.4–1.3)
Other	1.0 (0.9–1.0)	1.1 (0.9–1.4)	0.9 (0.7–1.1)	0.8 (0.4–1.6)
Education				
Less than high school	2.9 (1.7–4.9)	4.7 (1.7–13.3)	2.3 (0.4–13.8)	NA
High school graduate/GED	2.8 (1.7–4.7)	3.3 (1.4–7.6)	3.8 (3.3–4.3)	NA
Alternative education	3.0 (1.4–6.2)	NA	NA	NA
Some college	1.9 (1.1–3.2)	2.2 (1.0–5.3)	3.0 (2.7–3.4)	NA
Bachelor's degree	2.0 (1.2–3.4)	2.1 (0.9–5.1)	2.1 (1.9–2.2)	2.1 (1.8–2.5)
Graduate degree	1.0	1.0	1.0	1.0
Marital Status				
Single	1.5 (1.5–1.5)	1.3 (1.2–1.4)	1.5 (1.4–1.6)	1.4 (1.1–1.7)
Married, spouse not on active duty	1.0	1.0	1.0	1.0
Married, spouse on active duty, not deployed	0.7 (0.7–0.8)	0.5 (0.4–0.5)	0.9 (0.7–1.1)	0.7 (0.5–1.0)
Married, spouse on active duty, deployed	2.4 (2.0–2.9)	2.7 (2.5–3.0)	3.9 (2.8–5.3)	1.9 (1.3–2.6)
No longer married	1.0 (0.9–1.1)	0.8 (0.7–0.9)	1.0 (0.9–1.2)	1.3 (1.0–1.7)
Dependents				
Member only	1.6 (1.6–1.6)	1.3 (1.3–1.4)	1.7 (1.6–1.8)	1.7 (1.4–2.1)
Member plus one	1.3 (1.3–1.3)	1.1 (1.0–1.2)	1.6 (1.5–1.7)	1.1 (0.9–1.5)
Member plus two or more	1.0	1.0	1.0	1.0
Rank				
E1–E4	1.6 (1.6–1.6)	1.6 (1.5–1.7)	NA	NA
E5–E9	1.0	1.0	NA	NA
O1–O3	NA	NA	0.8 (0.8–0.9)	10.4 (2.5–42.2)
O4–O5	NA	NA	0.4 (0.4–0.4)	6.3 (1.5–25.7)
O6–O11	NA	NA	1.0	1.0
Time in service				
<6 months	2.2 (1.9–2.4)	4.6 (1.8–11.7)	1.9 (1.3–2.8)	1.0 (0.4–2.3)
6–12 months	3.2 (2.9–3.6)	5.4 (2.1–13.5)	5.5 (4.6–6.6)	3.2 (1.6–6.2)
>12–24 months	2.9 (2.6–3.2)	7.0 (2.8–17.6)	5.7 (5.0–6.5)	3.2 (1.7–6.2)
>24–60 months	2.8 (2.5–3.1)	4.1 (1.6–10.3)	4.5 (4.0–5.1)	2.6 (1.4–5.0)
>60–120 months	1.8 (1.7–2.1)	3.6 (1.5–9.1)	2.9 (2.6–3.3)	2.5 (1.3–4.7)
>120–180 months	1.6 (1.4–1.7)	2.6 (1.0–6.4)	2.6 (2.3–2.9)	1.8 (0.9–3.5)
>180–240 months	1.3 (1.1–1.4)	1.8 (0.7–4.7)	1.9 (1.6–2.1)	1.6 (0.8–3.2)
>240 months	1.0	1.0	1.0	1.0
Hazardous duty pay				
No hazardous duty pay	1.0	1.0	1.0	1.0
Hazardous duty pay one type	0.8 (0.8–0.9)	0.8 (0.7–0.9)	2.0 (1.8–2.2)	0.3 (0.0–2.2)
Hazardous duty pay two or more types in pay period	1.4 (1.3–1.5)	0.2 (0.0–1.7)	5.1 (2.9–8.8)	NA

Values are odds ratios for deployment and 95% confidence intervals (in parentheses).

[a] NA, No soldiers represented within these categories for the specific occupation, gender, and rank group displayed.

quences of service in the Persian Gulf. There have been relatively few studies documenting the prewar health and mental status of soldiers deployed to the Persian Gulf. The few studies that have focused on or at least briefly described differences between those who deployed and those who did not deploy to the Persian Gulf note that veterans deployed there were disproportionately

TABLE III

PREWAR SELF-REPORTED DEPRESSION, DISTRESS, STRESS, AND RISK-TAKING BEHAVIORS AND UNIVARIATE ASSOCIATIONS WITH DEPLOYMENT TO THE PERSIAN GULF AMONG 374 ARMY SOLDIERS COMPLETING AN HRA BEFORE AUGUST 1, 1990

Risk Factor	Deployed (N = 106)	Nondeployed (N = 268)	Odds Ratio[a]	95% Confidence Interval	Two-Tailed p Value
Reports considering suicide or experiencing prolonged/repeated periods of depression in past year (vs. never)	20%	31%	0.56	0.31–0.99	0.04
Reports feeling so overwhelmed with life that he or she considered hurting self in past year (vs. never)	2%	4%	0.45	0.05–2.13	0.37
Reports worries have interfered with daily life during past year (vs. never)	44%	49%	0.83	0.51–1.34	0.42
Reports having had serious problems dealing with spouse, parents, children, or friends (vs. never)	62%	70%	0.70	0.43–1.16	0.14
Reports feeling only somewhat or not satisfied at all with life in general (vs. mostly or totally satisfied)	14%	20%	0.66	0.33–1.26	0.19
Reports having experienced personal misfortune in past year (vs. none)	53%	61%	0.73	0.45–1.18	0.17
Reports feeling not satisfied with current job (vs. somewhat, mostly, or totally satisfied)	67%	72%	0.77	0.44–1.37	0.34
Reports feeling there is sometimes too much work stress (vs. never)	73%	68%	1.23	0.72–2.12	0.43
Reports seldom or never has time to relax (vs. sometimes or often)	14%	17%	0.87	0.42–1.65	0.62
Responds yes to one or more dependent drinking measures (vs. "no" to all)	11%	18%	0.55	0.25–1.21	0.11
Reports current smoking habits as					
Current smoker	21%	22%	0.93	0.50–1.71	0.82
Ex-smoker	21%	22%	0.90	0.48–1.65	0.90
(vs. never smoked)					
Reports he or she has often or sometimes experienced pleasant life change in past year (vs. seldom or never)	62%	39%	1.45	0.89–2.37	0.11
Reports engaging in at least one high-risk driving practice in past month or typically (vs. none)[b]	53%	46%	1.34	0.83–2.16	0.20

[a] Exact methods used to calculate odds ratios, 95% confidence intervals, and p values are described in EpiInfo.[31]

[b] Reports drinking and driving one or more times in past month, or speeding more than 5 miles over the limit, or not wearing seatbelt 100% of the time.

male and younger than veterans deployed elsewhere.[1,18,23] They were also more likely to be married than their nondeployed counterparts and differed significantly with respect to race or ethnicity, branch of service, activation status (e.g., reserve versus active duty), and grade.[1,18,23] Deployed veterans were more likely to be discharged or separated from the military soon after the war, although not because of death or medical disability.[23] Gray et al. also note that military personnel who were sent to the Persian Gulf had fewer prewar hospitalizations up to the point of deployment than their nondeployed counterparts, particularly in the years immediately preceding ODS/DS, similar to what we document among active duty Army personnel.[23] We expand upon these earlier observations by examining a longer period and by including an assessment of prewar risk-taking differences, self-appraised distress and well-being, and by focusing on active duty Army personnel. We also expand upon the strengths of earlier studies by using a comparison group that was more restrictive than those used by many other researchers. We reduce potential bias by including only nondeployed Gulf War-era veterans who were on active duty during the entire ODS/DS period.

Our data suggest that before the war Army soldiers who ultimately deployed to the Persian Gulf were significantly healthier and happier than their nondeployed counterparts, as measured by their hospitalization histories and self-reports. They were significantly less likely to report prewar experiences of depression or suicidal ideation, and they were significantly less likely to have experienced any prewar hospitalizations and, most noteworthy, hospitalizations for conditions most prevalent among postwar Army veterans seeking care. The data also suggest that deployed personnel were happier in their personal lives (families, life events) and jobs before the war than their nondeploying counterparts. Although small sample sizes limited our ability to detect statistically significant differences in many cases between the two cohorts, the consistency of the findings across measures of satisfaction and general well-being is compelling.

There is some evidence indicating that soldiers who deployed to the Persian Gulf may have been greater risk takers before deployment and/or may have faced greater hazards than nondeployed Gulf War-era veterans. They were more likely to have received hazardous duty pay for two or more different hazardous exposures before being deployed to the Gulf War theater. These prewar differences are driven primarily by more frequent receipt of pay for parachuting or for potential exposure to hostile fire. Indeed, these attributes or experiences might make the candidates likely prospects for wartime deployment.

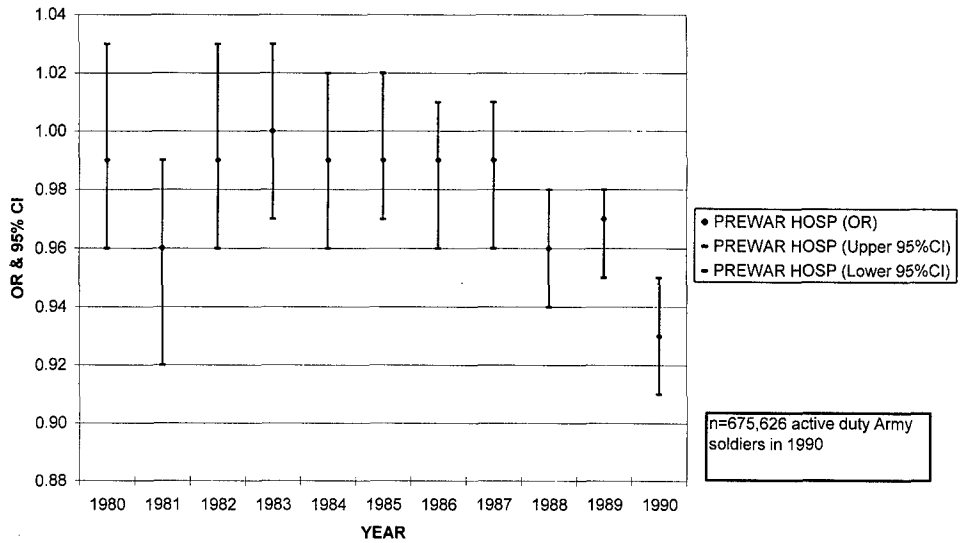

Fig. 1. OR and 95% CI for deployment status (outcome = any prewar hospitalizations 1980–1990) controlling for gender, age, ethnicity, total time in service, education, and rank. Demographics, physical, and mental health factors associated with deployment of U.S. Army soldiers to the Persian Gulf.

Other evidence for excess prewar risk-taking or risk exposure among deployers can be found in the records of prewar hospitalizations and self-reported behaviors. For most years between 1980 and 1990, annualized odds for injury hospitalizations were higher than for those not deployed, even after adjusting for potential confounders. Similarly, nonsignificant trends were observed that suggested that soldiers deployed to the Persian Gulf were also more likely to speed, drive after having had too much alcohol, or ride with someone who had consumed too much alcohol, and they were less likely to always wear seatbelts.

Those who were deployed to the Persian Gulf were significantly more likely to also have a spouse who was deployed. This may be an important modifying factor and should be considered in future studies examining risk factors for Gulf War-related illnesses. This seems particularly important given the findings of Gray et al., who note that even after controlling for several confounders married personnel were at greater risk for postwar hospitalizations for all causes.[23] Perhaps those who were married are at greater risk for postwar hospitalizations because they were likely to have a spouse also deployed to the Persian Gulf. These veterans might be experiencing even greater distress because of concerns about the well-being of their deployed spouses.

There are a few potential weaknesses of this study that deserve comment. First, because the HRA program was initiated in late 1987, there are relatively few HRAs from the prewar period, with the bulk of those used in this study coming from the years 1989 and 1990. However, because we are interested in prewar experiences of stressors or distress and health habits as they relate to postwar health, the close proximity of HRA measures we do have to the start of the ODS/DS period may also be considered a strength of this study. In addition, in spite of small

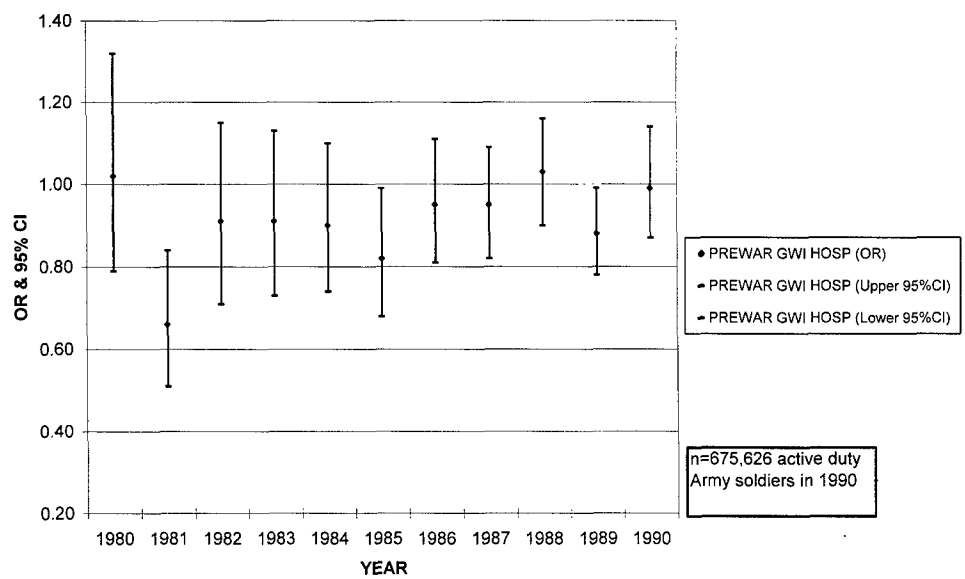

Fig. 2. OR and 95% CI for deployment status (outcome = prewar GWI hospitalizations 1980–1990) controlling for gender, age, ethnicity, total time in service, education, and rank. Demographics, physical, and mental health factors associated with deployment of U.S. Army soldiers to the Persian Gulf.

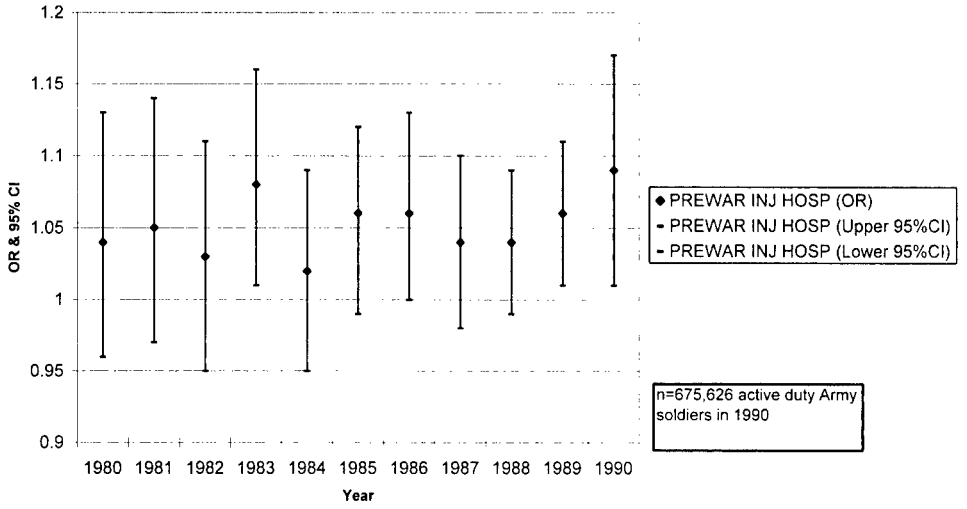

Fig. 3. OR and 95% CI for deployment status (outcome = prewar injury hospitalizations 1980–1990) controlling for gender, age, ethnicity, total time in service, education, and rank. Demographics, physical, and mental health factors associated with deployment of U.S. Army soldiers to the Persian Gulf.

samples, we are still able to demonstrate a significant difference in risk for depression and suicidal ideation in the prewar period. Second, the measures of health behaviors and life quality from the HRA are self-reported and cannot be validated directly by assessment of actual practices and life stressors. However, many studies have validated self-reported behaviors and found good correspondence between actual and reported behaviors.[32-38] The use of hospitalization diagnoses common among Army CCEP registrants may reduce the generalizability of our findings because not all veterans of the Persian Gulf chose to register or receive clinical evaluation under the CCEP program. Finally, the cohort defined here includes those who were on active duty for the entire ODS/DS period. Thus, individuals who enlisted during the war or who were discharged during the war are not included.

Conclusions

It seems unlikely, given these data, that any single prewar factor, such as excess stress, distress, difficulty coping, or poor health, will completely explain the health concerns and illnesses Gulf War veterans have experienced since the war. Our results suggest that the increased distress among Gulf War veterans compared with nondeployed Gulf War-era veterans found in some studies[22,39-41] is probably best understood as a consequence of the war experience rather than as a result elevated prewar levels of distress. However, the excess postwar injury mortality may be attributable to risk-taking habits or exposures that were present before deployment and that persisted even after the war. Although there is some cohesive evidence for excess risk-taking among deployers before the war, the strength of the evidence is weak. More information is needed documenting postwar risk-taking habits, particularly longitudinal data capable of documenting changes in habits that may have occurred after deployment.

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Appendix E

Bell NS, Amoroso PJ, Wegman DH, Senier L. Commentary: Proposed explanations for excess injury among veterans of the Persian Gulf War and a call for greater attention from policy-makers and researchers. Inj Prev 2001;7(1):4-7.

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SPECIAL FEATURE

Proposed explanations for excess injury among veterans of the Persian Gulf War and a call for greater attention from policymakers and researchers

N S Bell, P J Amoroso, D H Wegman, L Senier

Abstract

***Introduction*—Death rates among US veterans of the Persian Gulf War were lower than rates among non-deployed veterans and the US population at large, with the exception of injury deaths; returning veterans were at significantly greater risk of injury mortality. Similar patterns of excess injury mortality were documented among US and Australian veterans returning from Vietnam. In spite of these consistent findings little has been done to explain these associations and in particular to determine whether or not, and how, war related exposures influence injury risk among veterans returning home after deployments.**

***Hypothesized pathways*—Several potential pathways are proposed through which injury might be related to deployment. First, increases in injury mortality may be a consequence of depression, post-traumatic stress disorder, and symptoms of other psychiatric conditions developed after the war. Second, physical and psychological traumas experienced during the war may result in the postwar adoption of "coping" behaviors that also increase injury risk (for example, heavy drinking). Third, greater injury risk may be the indirect consequence of increased experiences of ill defined diseases and symptoms reported by many returning veterans. Fourth, veterans may experience poorer survivability for a given injury event resulting in greater mortality but not morbidity. Finally, the process that selects certain individuals for deployment may lead to a spurious association between deployment status and injury mortality by preferentially selecting individuals who are risk takers and/or exposed to greater hazards.**

***Conclusions*—More research and attention from policymakers is needed to clarify the link between deployment and postwar increased risk of injury.**

(*Injury Prevention* 2001;7:4–9)

Keywords: military personnel; veterans; wounds and injuries; Gulf War

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In 1990, the US and her military partners initiated a combined force against Iraq during Operation Desert Shield/Desert Storm (ODS/DS). Shortly after the war, participating soldiers began to report high rates of chronic, unexplained illnesses, which they believed might have been related to their service in the Gulf.[1–8] There has now been more than a decade of extensive public debate, congressional hearings, clinical evaluations, and research culminating in the expenditure of approximately one billion dollars (US) (LTC James R Riddle, US Air Force, Office of the Assistant Secretary of Defense, Clinical and Program Policy, Pentagon, oral communication, 13 January 2000). In the aftermath of this impressive effort, however, non-battle injury remains the only documented cause of increased postwar mortality among the soldiers who fought in the Gulf.[9–11] Even *during* ODS/DS unintentional non-battle injuries were a more common cause of fatality than battle related injuries or illnesses.[12 13] However, the etiology of this increased risk for injury fatality has not been evaluated; nor have effective intervention strategies been identified.

Little information has been published regarding *non-fatal* injury among deployed veterans of ODS/DS. We do know that non-fatal unintentional injuries and musculoskeletal conditions (which are often related to "old" injuries) comprised the single greatest category of outpatient visits during the war, caused the largest number of days lost from duty, and was the most common reason for evacuation from the Gulf.[13 14] A 1996 report found a slight, non-significant increase in risk of postwar injury hospitalization among deployed veterans as compared to non-deployed veterans.[15] A more recent study that links active duty records to civilian and Veteran's Administration data also suggests postdeployment excess injury morbidity risk.[16] Given that deployed veterans are at greater risk of fatal injury it seems likely that injury morbidity will also be greater. But because there have been so few studies investigating injury morbidity among ODS/DS veterans, we do not know how the frequency or severity of injuries differ for deployed US

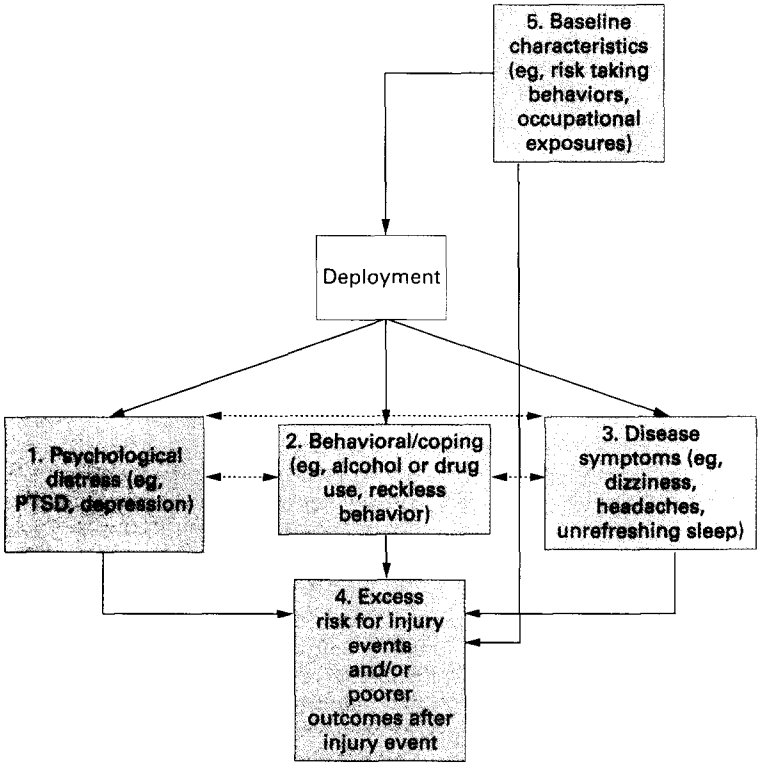

Figure 1 Potential explanations for the association between deployment and injuries (PTSD = post-traumatic stress disorder).

veterans. Even less is known about possible increases in injury morbidity among US military allied forces.

The link between deployment to war zones and subsequent increases in non-battle injuries is not unique to ODS/DS. Symptoms and health outcomes commonly reported by veterans of ODS/DS, including injuries, are similar to those reported by veterans of other conflicts.[17] For example, US veterans of the Vietnam conflict also experienced greater risk for injuries resulting from motor vehicle crashes, poisonings, fires and burns, homicide, and suicide after returning home.[18–26] An Australian study found that injury accounted for 74% of the postwar mortality among their soldiers who served in Vietnam.[27]

As with ODS/DS, attention from the media, policymakers, and researchers on the problems of Vietnam veterans focused almost exclusively on health outcomes *other* than the observed increased risk of injury mortality. Indeed, many of the mortality studies among Vietnam veterans were initiated in response to concerns from veterans about a possible relationship between exposure to herbicides and increases in cancer risk, and found the excess risk of injury serendipitously.[18–21 23 28]

Hypothesized explanations for excess injury

There are several ways in which deployment to a hostile environment may directly or indirectly increase risk of injury after redeployment. Figure 1 details five possible pathways, with references to known factors that support their theoretical basis.

(1) Higher rates of injury mortality may be a consequence of increases in clinical depression, post-traumatic stress disorder (PTSD), or other psychiatric conditions subsequent to service in the Gulf.[9] Such conditions have been documented among US, British, and Danish veterans of the Gulf War.[5–8 29–37] Studies have documented a link between conditions such as depression and PTSD, and subsequent risk for self inflicted injury.[38–47] Suicide risk and PTSD were greatest among Vietnam veterans who had been wounded during battle and/or had experienced psychological trauma while in Vietnam.[24–26] These states may also lead to increased risk for unintentional injuries. Depression, for example, may slow response time, and is associated with alcohol use. The association between alcohol use and injuries has been well documented in the literature. Comorbidities of depression and alcoholism are known to increase risk for suicide.[48 49]

(2) The physical and psychological traumas experienced during war may result in the postwar adoption of potentially unhealthy "coping behaviors". Several studies have documented an association between exposures to emotional or physical trauma and increased use of alcohol or other substances.[50–54] Indeed, the military may, on occasion, inadvertently support the use of alcohol for coping with stress. At a recent conference on operational stress, one commander related a story of how his unit was withdrawn from their deployment to a "neutral" location before returning to their families, and spoke frankly about the role the beer tent played as a tool for deployment related stress relief.[55] Changes in behavior may occur independent of any diagnosed mental illness or condition, yet still be an indirect consequence of an experience occurring in the Persian Gulf. For example, perceived near-death experiences have been shown to result in profound changes in values, beliefs, and behaviors as they relate to living and dying.[56–58] Such changes might result in more reckless behavior and less regard for personal safety.

(3) Increased risk of injury may be the indirect consequence of the ill defined diseases and symptoms reported by many veterans, including fibromyalgia, chronic fatigue syndrome, and symptoms such as dizziness, shakes or tremors, unrefreshing sleep, fatigue, muscle and joint pain, and confusion.[2 3 59–66] Whether or not these conditions are a direct consequence of service in the Gulf they are frequently reported by veterans of ODS/DS and may result in reduced response time or an inability to safely negotiate out of a hazardous situation (for example, motor vehicle collision avoidance). Alternatively or concurrently, a veteran suffering from these conditions might be more likely to make decisions that may increase exposures to hazardous circumstances. For example, they may be more inclined to enter a quarrel, which could escalate to interpersonal violence. Thus far, the documented association between service in the Gulf and increased injury mortality has not been evaluated to determine if certain subgroups (for example, those suffering from

multisymptom illnesses) are responsible for the observed differences in injury risk.

(4) Kang and Bullman report only an excess of injury *mortality*.[9] One recent study provides some information about non-fatal injuries suggesting that deployed veterans may be at increased risk for injury hospitalizations. However, the findings were not consistent across all types of hospital settings.[16] Without an understanding of the prevalence of *non-fatal* injury among deployed and non-deployed Gulf War era veterans it is impossible to ascertain whether or not veterans are at increased risk for injury events or whether they are at increased risk for death (or poorer outcomes in general) once they experience a given type of injury (for example, motor vehicle crash related injury). Psychological distress, coping behavioral responses, and illness symptoms may act as modifiers of an injury event. A veteran of ODS/DS who incurs a postwar injury may be more likely to experience adverse sequelae than an injured veteran who was not deployed to the Gulf, due to the presence of war related comorbidities.

(5) A final possible explanation for excess injury morbidity lies in the potential for bias related to selecting individuals for deployment who are inherently at greater injury risk. This increased injury risk may stem from a number of baseline personality or occupational characteristics such as: belonging to an occupational group with documented hazards (for example, vehicle drivers), risk taking or other behaviors (for example, speeding, smoking, alcohol consumption). These factors could increase risk of experiencing an injury event and/or result in a poorer outcome after the event (for example, smokers are more likely to experience stress fractures, and take longer to heal than non-smokers).[67 68]

There is little baseline information available that would allow exploration of prewar and postwar risk taking habits and injury predisposition among Gulf War era veterans. It is plausible, however, that the same factors that make a soldier a likely candidate for deployment may also be associated with greater risk of injury independent of the war. Soldiers who are sensation seekers or risk takers may be more inclined to self select to serve in the Gulf or to be employed in occupational specialties with a higher likelihood of deployment (for example, Infantry, Airborne, Rangers, and Special Forces). Our investigation demonstrates that soldiers who received special hazardous duty pay for activities such as parachuting or exposure to enemy fire in the period well before the start of ODS/DS were the same ones most likely to be deployed to the Persian Gulf, even after controlling for occupation.[69] Bricknell *et al* have also documented increased injuries among Army infantry who collect hazardous-duty pay as compared to infantry who do not collect this special pay.[70]

Increased injury frequency or severity may stem from any one of these five proposed explanations, some combination of them, or some other yet undiscovered pathway. In any case, injuries need to be further studied. This requires more support and attention from policymakers and researchers alike.

Barriers to the study of deployment related injuries

Despite evidence for the association between military deployment and excess injury, most research has focused on the search for a unifying case definition of "Gulf War illnesses," and a search for an etiologic pathway, or several pathways, to explain the myriad of symptoms and conditions reported by veterans of ODS/DS. While the importance of these chronic multisymptom illnesses and the disability and suffering experienced by veterans must not be trivialized, the lack of attention paid to the risk factors that contribute to raised injury mortality, and to designing and implementing interventions to reduce injury in this group of veterans, is puzzling.

One of our top research priorities should be the examination of the plausible hypothesis that excess rates of postwar injuries are the direct result of experiences, or the indirect result of exposures, that occurred during deployment. Other researchers and agencies have also expressed this sentiment.[71 72] To date, however, with the exception of the five studies that describe the excess risk for non-battle injury mortality,[9 11 14] discussion and review of injury among Gulf War veterans has been limited to studies describing battle related injuries and/or their psychological sequelae.[73–86] Few resources have been devoted to this issue: of the 159 million dollars spent between 1994–99 on research related to ODS/DS veterans' health, only a small proportion has gone to the study of excess injury.[87] Though one study is currently being conducted to evaluate motor vehicle injuries in this population,[88] we are not aware of any projects underway at this time that will clarify the specific etiologic pathways leading to increased injury mortality among deployed veterans. While there has been some effort to increase the study of injury etiology and prevention in the military at large, ironically the relationship between deployment to war and peacekeeping missions, and the non-battle injuries that occur during and after deployments, are not receiving appropriate emphasis.[13 89 90]

A thorough examination of the relationship between deployment and injuries is undoubtedly hampered by the misperception that injuries are the end result of random, uncontrollable events. This is in spite of the extensive list of studies that have demonstrated time and again how well designed interventions have reduced injury rates in both civilian and military settings.[91 92] The Navy, for example, has succeeded in reducing class A aviation crashes from 55/100 000 flying hours to only 3/100 000 flying hours over the past 50 years.[89] This impressive decline in loss of life and property has been accomplished through engineering changes (for example, the angling of aircraft carrier decks) and persistent systematic application of training and safety initiatives.[93]

A related explanation for the relative lack of attention to injury mortality is that veterans who suffer from ill defined conditions and symptoms have lobbied for research devoted to finding a cure or improved treatment for ailing veterans. By contrast, families of veterans killed in motor vehicle crashes or other injury events, veterans' advocacy groups, or even injured veterans themselves may not lobby for increased research into injury prevention if they too subscribe to the misconception that injuries are the end result of random events. Likewise, self inflicted injuries may appear to have no external cause at all, as blame is often mistakenly placed solely on the individual.

The link between deployment and injury may also not be readily identified in part due to the way injury is usually treated. In a clinical setting, acute trauma is managed almost entirely in emergency departments and acute care clinics where there may be little continuity of care and therefore no discovery or cause for investigation of a potential common pathway. Physicians treating victims of acute trauma need to broaden their understanding of the risk factors that might predispose a patient to injury to include deployment related conditions.

Key points

- Death rates among US veterans were lower than rates among non-deployed veterans and the US population at large, with the exception of injury deaths; deployed veterans were at significantly greater risk of injury mortality after the war.
- We propose several pathways through which risk of injury might be related to deployment:

(1) Increases in postwar injury mortality may be a consequence of depression, PTSD, and symptoms of other psychiatric conditions developed after the war.
(2) Physical and psychological traumas experienced during the war may result in the postwar adoption of "coping" behaviors that also increase injury risk (for example, heavy drinking).
(3) Greater injury risk may be the indirect consequence of ill defined diseases and symptoms (for example, fatigue, concentration difficulties) reported by many deployed veterans.
(4) Veterans may experience poorer survivability for a given injury event resulting in greater mortality but not morbidity.
(5) The process that selects certain individuals for deployment may lead to a spurious association between deployment status and injury mortality by preferentially selecting individuals who are risk takers and/or exposed to greater hazards.

- A similar pattern of increased postwar injury mortality was observed after the Vietnam War. More research and attention from policy makers is needed to clarify the link between deployment and postwar increased risk of injury.

Recommendations for future studies

The US military has made significant progress in recent years in recognizing the extent and severity of the injury problem across all branches of the armed forces. There is now a large corps of researchers who are studying costs and the impact injuries have on the mission and readiness of the military. Three important publications have emerged in the past few years documenting the epidemiologic evidence that has come to light as a result of these efforts.[94] These efforts are laudable, and demonstrate that the military is moving in the right direction by recognizing and documenting the extent of the problem, and putting programs in place that will likely reduce injury. However, what is lacking is a comprehensive research program to explore the causes and prevention alternatives for the specific deployment related injury excesses that have been consistently identified. A concerted effort is essential if we are to determine the etiology of increased injury risk among this special subgroup of deployed soldiers, whose risks are unlikely to be identified through the existing efforts and who will very likely require specially tailored intervention efforts.

Those interested in exploring the link between deployment and non-battle injuries, and in designing prevention programs, need better information about the reasons for the observed increased injury risk among veterans. The following appear to be important steps in this effort: document the incidence of non-fatal injury among deployed and non-deployed veterans both in the US and abroad; explore the role of risk taking behaviors before and after deployment; determine whether there are subpopulations at unique or particular risk for behavior changes; identify potential modifying factors that protect individuals from injury or from suffering poor outcomes after injury; identify associations between postdeployment mental health and injury; and evaluate the association between injuries and the symptom based conditions historically experienced by ODS/DS veterans. Longitudinal data sources that include measures of behavior before and after ODS/DS, though hard to come by, would be particularly useful. Focus groups or similar qualitative assessment tools may also provide important insights into risk taking habits and changes in safety related behaviors among redeploying service members.

Since injuries are more easily identified and measured than multisymptom illnesses, research into risk factors and effect modifiers may be quite cost effective and result in more immediate health improvements for veterans of the Gulf War as well as those deployed in future conflicts and peacekeeping missions. These efforts are also likely to result in significant cost savings to the federal government. There are currently more than 2.2 million people receiving disability compensation from the Veteran's Administration, about a third of whom have

musculoskeletal system disabilities and receive direct payments of well over four billion dollars per year.[95] The vast majority of disability discharges due to musculoskeletal conditions are the end result of injuries that occurred while in the military.[96]

Before successful interventions can be planned we need well designed studies to clarify the etiology of excess injury. This will not happen with a restrictive focus on chronic multisymptom illnesses to the exclusion of injuries. Non-battle injury must be seen as a condition potentially related to deployment. There must be high level support for injury research in this population, a re-evaluation of the current research agenda, and a reprioritization of related activities.

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Why are people who return from war at increased risk of injury?

In 1990, the United States and its military partners initiated a combined force against Iraq during Operation Desert Shield/Desert Storm (ODS/DS). Shortly after the war, participating soldiers began to report high rates of chronic, unexplained illnesses that they believed might have been related to their service in the Persian Gulf.[1-8] There has now been more than a decade of extensive public debate, congressional hearings, clinical evaluations, and research culminating in the expenditure of about $1 billion (US) (LTC James R Riddle, US Air Force, Office of the Assistant Secretary of Defense, Clinical and Program Policy, Pentagon, oral communication, January 13, 2000). In the aftermath of this impressive effort, however, nonbattle injury remains the only documented cause of increased postwar mortality among the soldiers who fought in ODS/DS.[9-11] Even during this conflict, unintentional nonbattle injuries were a more common cause of death than battle-related injuries or illnesses.[12,13] However, the etiology of this increased risk for injury fatality has not been evaluated, nor have effective intervention strategies been identified.

Little information has been published regarding nonfatal injury among deployed veterans of ODS/DS. We do know that nonfatal unintentional injuries and musculoskeletal conditions (which are often related to "old" injuries) comprised the single greatest category of outpatient visits during the war, caused the most days lost from duty, and was the most common reason for evacuation from the Persian Gulf.[13,14] A 1996 report found a slight, nonsignificant increase in the risk of hospitalization for postwar injury among deployed veterans compared with nondeployed veterans.[15] A more recent study that links active-duty records to civilian and Department of Veterans Affairs data also suggests excess injury morbidity risk following deployment.[16] Given that deployed veterans are at greater risk of fatal injury, injury morbidity would also likely be greater. But because few studies have investigated injury morbidity among ODS/DS veterans, we do not know how the frequency or severity of injuries differs for deployed US veterans. Even less is known about possible increases in injury morbidity among US military allied forces.

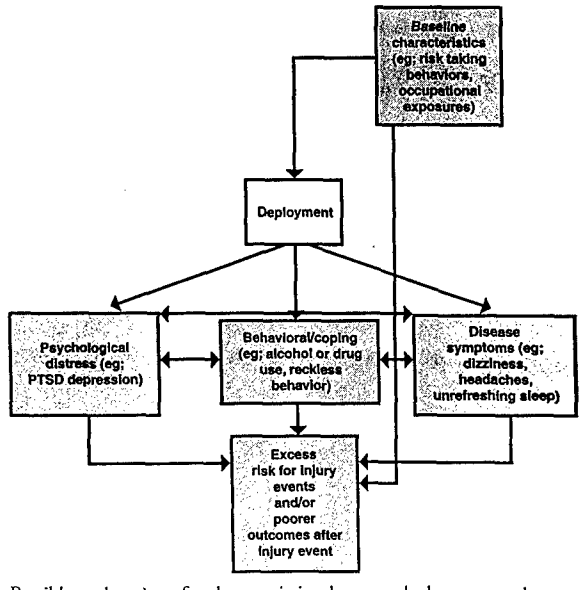
The link between deployment to war zones and subsequent increases in nonbattle injuries is not unique to ODS/DS. Symptoms and health outcomes commonly reported by veterans of ODS/DS, including injuries, are similar to those reported by veterans of other conflicts.[17] For example, US veterans of the Vietnam conflict also had greater risk for injuries resulting from motor-vehicle crashes, poisonings, fires and burns, homicide, and suicide after returning home.[18-26] An Australian study found that injury accounted for 74% of the postwar mortality among their soldiers who served in Vietnam.[27]

As with ODS/DS, attention from the media, policymakers, and researchers on the problems of Vietnam veterans focused almost exclusively on health outcomes other than the observed increased risk of injury mortality. Indeed, many of the mortality studies among Vietnam veterans were initiated in response to concerns from veterans about a possible relationship between exposure to herbicides and increases in cancer risk, and the excess risk of injury was found serendipitously.[18-21,23,28]

HYPOTHESIZED EXPLANATIONS FOR EXCESS INJURY

Deployment to a hostile environment may directly or indirectly increase the risk of injury after redeployment in several ways. The figure details 5 possible pathways, with references to known factors that support their theoretical basis.

First, higher rates of injury mortality may be a consequence of an increased prevalence of clinical depression, post-traumatic stress disorder (PTSD), or other psychiatric conditions subsequent to service in the Persian Gulf.[9] Such conditions have been documented among US, British, and Danish veterans of the Gulf War.[5-8,29-37] Studies have documented a link between conditions such as depression and PTSD and a subsequent risk for self-inflicted injury.[38-47] Suicide risk and PTSD were greatest among Vietnam veterans who had been wounded during battle, had experienced psychological trauma while in Vietnam, or both.[24-26] These states may also lead to an increased risk for unintentional injuries. Depression, for example,



Possible explanations for the association between deployment and injuries (PTSD = post-traumatic stress disorder)

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A US marine at ready with automatic weapon during Operation Desert Storm. War-related stressors and exposure may increase postwar risk of injury. (US Forces in Desert Storm CD-ROM, compiled by the Defense Visual Information Center, March Air Reserve Base, CA)

may slow response time and is associated with alcohol use. The association between alcohol use and injuries has been well documented in the literature. Comorbidities of depression and alcoholism are known to increase the risk for suicide.[48,49]

Second, the physical and psychological traumas experienced during war may result in the postwar adoption of possibly unhealthy "coping" behaviors. Several studies have documented an association between exposures to emotional or physical trauma and increased use of alcohol or other substances.[50-54] Indeed, the military may, on occasion, inadvertently support the use of alcohol for coping with stress. At a recent conference on operational stress, a commander related a story of how his unit was withdrawn from their deployment to a "neutral" location before returning to their families and spoke openly about the role the beer tent played as a tool for deployment-related stress relief.[55] Changes in behavior may occur independent of any diagnosed mental illness or condition and yet be an indirect consequence of an experience occurring in the Persian Gulf. For example, perceived near-death experiences have been shown to result in profound changes in values, beliefs, and behaviors as they relate to living and dying.[56-58] Such changes might result in more reckless behavior and less regard for personal safety.

Third, an increased risk of injury may be the indirect consequence of the ill-defined diseases and symptoms reported by many veterans, including fibromyalgia; chronic fatigue syndrome; and symptoms such as dizziness, shakes or tremors, unrefreshing sleep, fatigue, muscle and joint pain, and confusion.[2,3,59-66] Whether or not these conditions are a direct consequence of service in the Persian Gulf, they are frequently reported by veterans of ODS/DS and may result in reduced response time or an inability to navigate safely out of a hazardous situation (for example, to avoid a motor-vehicle collision). Alternatively or concurrently, veterans suffering from these conditions might be more likely to make decisions that may increase exposures to hazardous circumstances. For example, they may be more inclined to enter a quarrel, which could escalate to interpersonal violence. Thus far, the documented association between service in the Gulf War and increased injury mortality has not been evaluated to determine if certain subgroups (for example, those suffering from multisymptom illnesses) are responsible for the observed differences in injury risk.

Fourth, Kang and Bullman report only an excess of injury mortality.[9] A recent study provides some information about nonfatal injuries and suggests that deployed veterans may be at increased risk for injury hospitalizations. However, the findings were not consistent across all types of hospital settings.[16] Without an understanding of the prevalence of nonfatal injury among deployed and nondeployed Gulf War-era veterans, it is impossible to ascertain whether veterans are at an increased risk for injury events or for death (or poorer outcomes in general) once they experience a given type of injury (for example, motor-vehicle crash-related injury). Psychological distress, coping behavioral responses, and illness symptoms may act as modifiers of an injury event. Because of the presence of war-related comorbidities, a veteran of ODS/DS who incurs a postwar injury may be more likely to experience adverse sequelae than an injured veteran who was not deployed to the Persian Gulf.

A final possible explanation for excess injury morbidity lies in the potential for bias related to selecting persons for deployment who are inherently at greater injury risk. This increased injury risk may stem from a number of baseline personality or occupational characteristics, such as belonging to an occupational group with documented hazards (for example, vehicle drivers) or risk-taking or other behaviors (for example, speeding, smoking, alcohol consumption). These factors could increase the risk of an injury event, result in a poorer outcome after the event (for example, smokers are more likely to have stress fractures and to take longer to heal than nonsmokers), or both.[67,68]

Little baseline information is available that would allow exploration of prewar and postwar risk-taking habits and injury predisposition among Gulf War-era veterans. It is plausible, however, that the same factors that make a soldier a likely candidate for deployment may also be associated with a greater risk of injury independent of the war. Soldiers who are sensation seekers or risk takers may be more inclined to self-select to serve in the Gulf War or to be employed in occupational specialties with a higher likelihood of deployment (for example, Infantry, Airborne, Rangers, and Special Forces). Our investigation demonstrates that soldiers who received special hazardous-duty

pay for activities such as parachuting or exposure to enemy fire in the period well before the start of ODS/DS were the ones most likely to be deployed to the Persian Gulf, even after controlling for occupation.[69] Bricknell et al have also documented increased injuries among Army infantry who collect hazardous-duty pay as compared with infantry who do not collect this special pay.[70]

Increased injury frequency or severity may stem from any 1 of these 5 proposed explanations, some combination of them, or some other yet-undiscovered pathway. In any case, injuries need to be further studied. This requires more support and attention from policymakers and researchers alike.

BARRIERS TO THE STUDY OF DEPLOYMENT-RELATED INJURIES

Despite evidence for the association between military deployment and excess injury, most research has focused on the search for a unifying case definition of "Gulf War illnesses" and for an etiologic pathway, or several pathways, to explain the myriad symptoms and conditions reported by veterans of ODS/DS. Although we realize the importance of these chronic multisymptom illnesses and the disability and suffering experienced by veterans, we are puzzled by the lack of attention paid to the risk factors that contribute to raised injury mortality and to designing and implementing interventions to reduce injury in this group of veterans.

One of our top research priorities should be the examination of the plausible hypothesis that excess rates of postwar injuries are the direct result of experiences, or the indirect result of exposures, that occurred during deployment. Other researchers and agencies have also expressed this belief.[59,71] To date, however, with the exception of the 5 studies that describe the excess risk for nonbattle injury mortality,[9,11-14] discussion and review of injury among Gulf War veterans have been limited to studies describing battle-related injuries, their psychological sequelae, or both [see previous publication for a list of these studies]. Few resources have been devoted to this issue: of the $159 million spent between 1994 and 1999 on research related to ODS/DS veterans' health, only a small proportion has gone to the study of excess injury.[72] Although 1 study is currently being conducted to evaluate motor-vehicle injuries in this population,[73] we are not aware of any projects under way at this time that will clarify the specific etiologic pathways leading to increased injury mortality among deployed veterans. Although there has been some effort to increase the study of injury etiology and prevention in the military at large, ironically the relationship between deployment to war and peacekeeping missions and the nonbattle injuries that occur during and after deployments are not receiving appropriate emphasis.[13,74,75]

A thorough examination of the relationship between deployment and injuries is undoubtedly hampered by the misperception that injuries are the end result of random, uncontrollable events. This is despite the extensive list of studies that have demonstrated time and again how well-designed interventions have reduced injury rates in both civilian and military settings.[76,77] The Navy, for example, has succeeded in reducing class A aviation crashes from 55 per 100,000 flying hours to only 3 per 100,000 flying hours over the past 50 years.[74] This impressive decline in loss of life and property has been accomplished through engineering changes (for example, the angling of aircraft carrier decks) and through persistently and systematically applying training and safety initiatives.[78]

A related explanation for the relative lack of attention to injury mortality is that veterans who suffer from ill-defined conditions and symptoms have lobbied for research devoted to finding a cure for or improved treatment of ailing veterans. By contrast, families of veterans killed in motor-vehicle crashes or other injury events, veterans' advocacy groups, or even injured veterans themselves may not lobby for increased research into injury prevention if they, too, subscribe to the misconception that injuries are the end result of random events. Likewise, self-inflicted injuries may appear to have no external cause because blame is often mistakenly placed solely on the individual.

The link between deployment and injury may also not be readily identified in part because of the way injury is usually treated. In a clinical setting, acute trauma is managed almost entirely in emergency departments and acute care clinics, where there may be little continuity of care and, therefore, no discovery or cause to investigate a possible common pathway. Physicians who treat victims of

LM Otero/AP

Gulf War veteran Chris Yarger has difficulty walking. Postdeployment illness or disability may increase the risk of injury.

Soldiers who fought in Desert Storm were subjected to numerous stressors. These exposures may influence risk for postwar injury. (US Forces in Desert Storm CD-ROM, compiled by the Defense Visual Information Center, March Air Reserve Base, CA)

acute trauma need to broaden their understanding of the risk factors that might predispose a patient to injury to include deployment-related conditions.

RECOMMENDATIONS FOR FUTURE STUDIES

The US military has made substantial progress in recent years in recognizing the extent and severity of the injury problem across all branches of the armed forces. A large corps of researchers is now studying the costs and the effects that injuries have on the mission and readiness of the military. Two important publications have emerged in the past few years documenting the epidemiologic evidence that has come to light as a result of these efforts: the *Atlas of Injuries in the US Armed Forces,* a supplement to *Military Medicine,* and *Injuries in the Military: A Hidden Epidemic,* a supplement to the *American Journal of Preventive Medicine.*[79,80] These efforts are laudable and demonstrate that the military is moving in the right direction by recognizing and documenting the extent of the problem and putting programs in place that will likely reduce injury. However, what is lacking is a comprehensive research program to explore the causes and prevention alternatives for the specific deployment-related injury excesses that have been consistently identified. A concerted effort is essential if we are to ascertain the etiology of increased injury risk among this special subgroup of deployed soldiers, whose risks are unlikely to be identified through the existing efforts and who will likely require specially tailored intervention efforts.

Those interested in exploring the link between deployment and nonbattle injuries and in designing prevention programs need better information about the reasons for the observed increased injury risk among veterans. The following appear to be important steps in this effort:

- Document the incidence of nonfatal injury among deployed and nondeployed veterans both in the United States and abroad
- Explore the role of risk-taking behaviors before and after deployment
- Determine whether there are subpopulations at unique or particular risk for behavior changes
- Identify possible modifying factors that protect individuals from injury or from suffering poor outcomes after injury
- Identify associations between postdeployment mental health and injury
- Evaluate the association between injuries and the symptom-based conditions historically experienced by ODS/DS veterans.

Longitudinal data sources that include measures of behavior before and after ODS/DS, although hard to come by, would be particularly useful. Focus groups or similar qualitative assessment tools may also provide important insights into risk-taking habits and changes in safety-related behaviors among redeploying service members.

Because injuries are more easily identified and measured than multisymptom illnesses, research into risk factors and effect modifiers may be cost-effective and result in more immediate health improvements for veterans of the Gulf War and those deployed in future conflicts and peacekeeping missions. These efforts are also likely to result in substantial cost savings to the federal government. Currently more than 2.2 million people receive disability compensation from the Department of Veterans Affairs, about a third of whom have musculoskeletal system disabilities and receive direct payments of well over $4 billion per year.[81] The vast majority of disability discharges due to musculoskeletal conditions are the end result of injuries that occurred while in the military.[82]

Before successful interventions can be planned, we need well-designed studies to clarify the etiology of excess injury. This will not happen with a restrictive focus on chronic multisymptom illnesses to the exclusion of injuries. Nonbattle injury must be seen as a condition possibly related to deployment. There must be high-level support for injury research in this population, a reevaluation of the current research agenda, and a reprioritization of related activities.

Acknowledgments: The contents herein are the sole responsibility of the authors and do not necessarily represent the position or the policy of the National Institute on Alcohol Abuse and Alcoholism, the US Army Medical Research Acquisition Activity, the US Army, or the Department of Defense. No official endorsement should be inferred.

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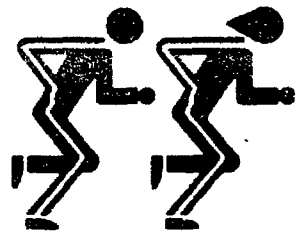
Appendix F

The Army's Health Risk Appraisal (HRA) questionnaire (1990 and 1992 versions)

THE ARMY HEALTH PROMOTION PROGRAM

Fit to Win



HEALTH RISK APPRAISAL

DEATH STATISTICS

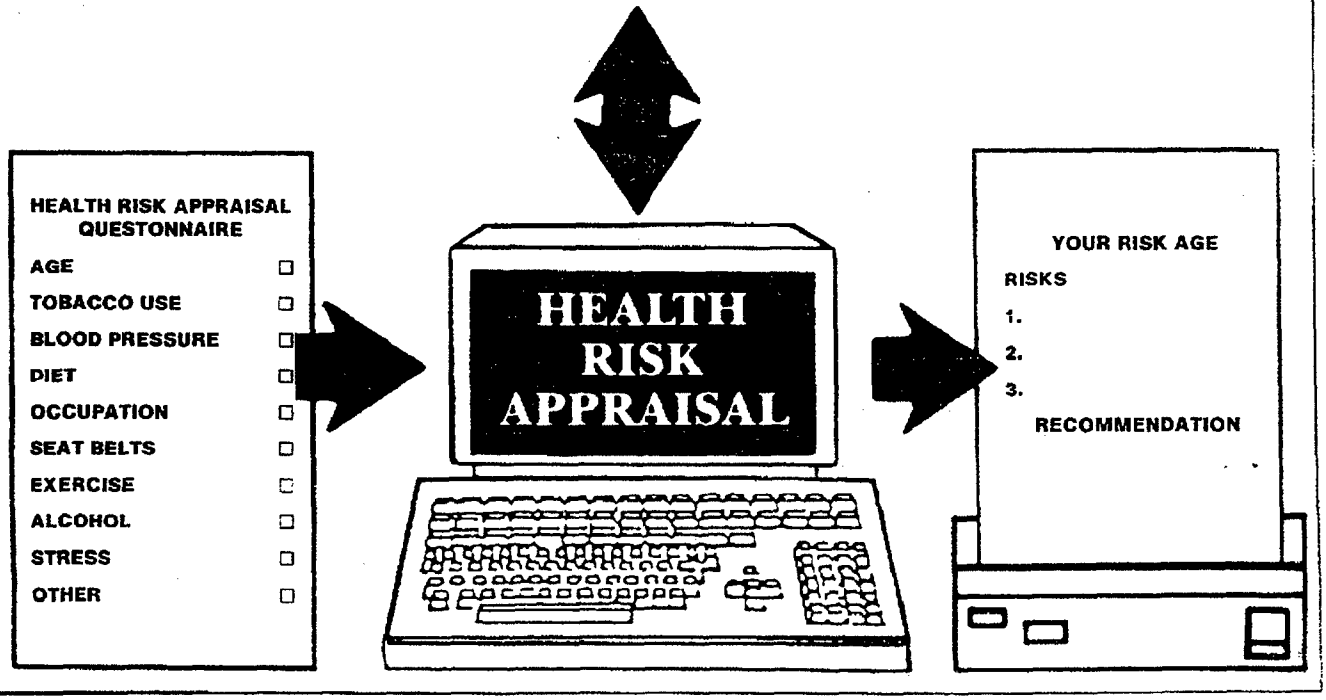
DATA ON DISEASES

OCCUPATIONAL RISK DATA

HOSPITAL DATA

BEHAVIORAL RISK SURVEY DATA

U.S. CENSUS DATA



For use of this form, see AR40-501 and AR600-63; the proponent agency is TSG

DA Form 5675, 1 Oct 90 (Edition of May 88 is obsolete)

0705700

UNITED STATES ARMY

FIT TO WIN™

The HEALTH RISK APPRAISAL is an activity of

THE ARMY HEALTH PROMOTION PROGRAM

How does the Health Risk Appraisal work?

The health risk appraisal is a personalized estimation of your risks of death and major illness in the next ten years. First, the program uses your age and health-related personal habits, as well as national statistics on risk factors and diseases, to calculate your current risks.

Your risk may be expressed in terms of RISK AGE or HEALTH SCORE. Ideally, you want a risk age lower than your real age or a health score of 100 points.

The second part of your health risk appraisal calculates your risks again, as if your risk factors were reduced as much as possible. The result is your "target" risk age or health score. It shows your potential benefit, in health terms, of improving your lifestyle-if you quit smoking, wear safety belts, take moderate exercise, etc.

Therefore, your health risk appraisal report includes your real age, your current risk age and your target risk age. Your current risk age tells you how healthy your lifestyle is right now, and your target risk age lets you know how much longer and healthier you can live with a few positive changes in your lifestyle.

PLEASE ANSWER QUESTIONS AS HONESTLY AND AS CORRECTLY AS YOU CAN. This will allow you to receive the most accurate assessment of your health.

The results of the Health Risk Appraisal are for you. No copy will be placed in your military or medical records. We ask that you give us your name so we can return your results and any recommendations for follow-up care to you. We also ask for your social security number so we can statistically track trends in health awareness over long periods of time. Statistical information may be collected from an armywide database which will contain your information, but your name and social security number will be covered and cannot be read. The rules of the Privacy Act apply to any information that you give in the Health Risk Appraisal.

IMPORTANT NOTE! The health risk appraisal is no substitute for a physical examination or check-up. It will not give you a diagnosis nor will it tell you how long you will actually live. However, the health risk appraisal will help you understand and recognize your risk factors.

INSTRUCTIONS

Please use a No. 2 Pencil only to complete this survey. Make dark, black marks that fill the response boxes completely.

EXAMPLE: Correct ☐ ■ ☐ Incorrect ☑ ☒ ◪

Health Risk Appraisal (HRA)
for use of this form, see
AR40-501 and AR600-63;
the proponent is TSG

For MILITARY ONLY: Complete Questions 1-4.

1. What is your branch of service?

1. ☐ U.S. Army ☐ U.S. Marines ☐ U.S. Navy ☐ U.S. Coast Guard ☐ U.S. Air Force ☐ Other

2. What is your military status?

2. ☐ Regular Army ☐ USAR ☐ USAR/AGR ☐ ARNG ☐ ARNG/AGR ☐ Other

3. What is your current rank?

3.

ENLISTED		OFFICER		WARRANT OFFICER
☐ E-1	☐ E-6	☐ O-1	☐ O-6	☐ WO
☐ E-2	☐ E-7	☐ O-2	☐ O-7	☐ WO
☐ E-3	☐ E-8	☐ O-3	☐ O-8	☐ WO
☐ E-4	☐ E-9	☐ O-4	☐ O-9	☐ WO
☐ E-5		☐ O-5	☐ O-10	

4. What is your Unit Identification Code?
(Enter Specific Unit Identifier)

Print your Unit Identification Code in these blank boxes. →

Then fill in the corresponding response box below each number/letter.

4.

UNIT CODE

A	A	A	A	A	A
B	B	B	B	B	B
C	C	C	C	C	C
D	D	D	D	D	D
E	E	E	E	E	E
F	F	F	F	F	F
G	G	G	G	G	G
H	H	H	H	H	H
I	I	I	I	I	I
J	J	J	J	J	J
K	K	K	K	K	K
L	L	L	L	L	L
M	M	M	M	M	M
N	N	N	N	N	N
O	O	O	O	O	O
P	P	P	P	P	P
Q	Q	Q	Q	Q	Q
R	R	R	R	R	R
S	S	S	S	S	S
T	T	T	T	T	T
U	U	U	U	U	U
V	V	V	V	V	V
W	W	W	W	W	W
X	X	X	X	X	X
Y	Y	Y	Y	Y	Y
Z	Z	Z	Z	Z	Z
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

PRIVACY ACT STATEMENT

AUTHORITY: 29 CFR Chapter XVII, Occupational Safety and Health Standards; 5 U.S.C., section 150; Executive Orders 11612 and 11807 authorize the collection of this information.

PURPOSE: The primary use of this information is by the unit medical care providers to assure competent medical care. Additional disclosures of this information may be: To the Office of the Army Surgeon General in aggregated form to develop Army/Command fitness profiles; to Army medical researchers for the purpose of correlating health precursors to health problems or to commercial medical researchers for the same purpose. Where data from this system of records are provided to agencies external to the Army, Social Security Number and Name will be deleted.

ROUTINE USES: Information may be disclosed to departments and agencies of the Executive Branch in performance of their official duties relating to health risk appraisal and cardiovascular screening.

DISCLOSURE: Furnishing the information required on this form is mandatory for all Department of the Army active duty and reserve component military personnel. We ask that you give your name so we can return your results and any recommendations for follow-up care to you. We also ask for your social security number so we can statistically track trends in health awareness over long periods of time.

0795705 CAR

- ☐ Spouse (husband or wife of active duty or Military Retiree)
- ☐ Retiree
- ☐ Son or daughter of Active Duty or Military Retiree
- ☐ DOD Employee
- ☐ Non-DOD Employee
- ☐ Other

5. For CIVILIANS ONLY: Complete Questions 5-6. Mark ALL categories applicable to you.

☐ WG	☐ GS	☐ SES	☐ GM
☐ 1	☐ 6	☐ 11	☐ 16
☐ 2	☐ 7	☐ 12	☐ 17
☐ 3	☐ 8	☐ 13	☐ 18
☐ 4	☐ 9	☐ 14	
☐ 5	☐ 10	☐ 15	

6. If you are a Civilian Government Employee, enter your category and current pay grade.

7. LAST NAME | **FI**

FOR ALL INDIVIDUALS

7. Your Name.

Print the first ten letters of your last name and your first initial in these blank boxes.

Then fill in the corresponding response box below each letter.

- ☐ AD or RM
- ☐ Spouse of AD or RM
- ☐ 1st ☐ 2nd ☐ 3rd ☐ 4th ☐ 5th Child
- ☐ Not Applicable

8. ARE YOU: (Mark ALL applicable categories)

Active Duty or Retired Military
Spouse of Active Duty or Retired Military
1st, 2nd, 3rd, 4th, or 5th child of Active Duty or Retired Military
Not Applicable

YOUR SPONSOR'S SOCIAL SECURITY NUMBER OR YOUR SOCIAL SECURITY NUMBER

— —

9. Print your SSN in the blank boxes. Then fill in the corresponding response box below each number.

* **If ACTIVE DUTY or RETIRED military, enter your SSN**
* **If a FAMILY MEMBER OF active duty or retired, enter sponsors SSN**
* **For ALL OTHERS, enter your SSN**

10. This Health Risk Appraisal is being administered in the following situation:

10. ☐ In-Processing
☐ Periodic Physical Examination
☐ Pre-Physical Fitness Test
☐ Occupational Health Program
☐ Walk-In
☐ Other

11. Racial/Ethnic Background
Mark the most appropriate category.

11. ☐ American Indian or Alaska Native
☐ Asian/Oriental ☐ White, Hispanic
☐ Black, Hispanic ☐ White, Non-Hispanic
☐ Black Non-Hispanic ☐ Other
☐ Pacific Islander

12. Marital Status.
Mark the most appropriate category.

12. ☐ Married ☐ Separated
☐ Never Married ☐ Widowed
☐ Divorced ☐ Other

13. Are you MALE or FEMALE?

13. ☐ **Male** ☐ **Female**

14. Your Age **15. Your Height** **16. Your Weight**

BEFORE you fill in the response boxes write age, height, and weight at the top of the columns.

EXAMPLE:
HEIGHT = 6 feet-0 inches
(Must enter if 0 inches)

HEIGHT	
FEET	INCHES
6	0

14. AGE (YEARS) 15. HEIGHT (FEET, INCHES) 16. WEIGHT (POUNDS)

17. What is your Body Frame Size?

17. ☐ Small
☐ Medium
☐ Large

18. How often do you do exercises that improve muscle strength, such as pushups, situps, weight lifting, a Nautilus/Universal workout, resistance training, etc...?

18. ☐ 3 or more times a week
☐ 1 or 2 times a week
☐ Rarely or never

19. How often do you do at least 20 minutes of non-stop aerobic activity (vigorous exercise that greatly increases your breathing and heart rate such as running, fast walking, biking, swimming, rowing, etc...)?

19. ☐ 3 or more times a week
☐ 1 or 2 times a week
☐ Rarely or never

20. How often do you eat high fiber foods such as whole grain breads, cereals, bran, raw fruit, or raw vegetables?

20. ☐ At every meal
☐ Daily
☐ 3-5 days a week
☐ Less than 3 days a week
☐ Rarely or never

21. How often do you eat foods high in saturated fats such as beef, hamburger, pork, sausage, butter, whole milk, cheese, etc...?

21. ☐ At every meal
☐ Daily
☐ 3-5 days a week
☐ Less than 3 days a week
☐ Rarely or never

22. Do you usually salt your food before tasting?

22. ☐ **Yes** ☐ **No**

3 CAR/TRK/VAN ,000

23 MOTORCYCLE ,000

23.a. In the next 12 months how many thousands of miles will you travel by car, truck or van?

23.b. In the next 12 months how many thousands of miles will you travel by motorcycle?

NOTE: U.S. average for cars is 10,000 miles

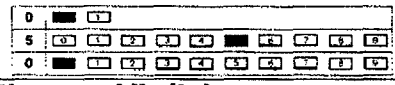
4. ☐ Walk ☐ Bike ☐ Motorcycle ☐ Sub/Compact Car ☐ Mid or Full Car ☐ Bus/Subway/Train ☐ Truck/Van ☐ Stay at Home

24. On a typical day how do you usually travel? (Mark only one)

5.

25. What percent of the time do you usually buckle your safety belt when driving or riding?

EXAMPLE: 50%



6. ☐ Within 5 MPH of limit ☐ 6-10 MPH Over ☐ 11-15 MPH Over ☐ More than 15 MPH Over ☐ Don't Drive

26. On the average, how close to the speed limit do you usually drive?

7. NO. OF TIMES

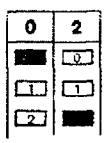
28. NO. OF DRINKS

27. How many times in the last month did you drive or ride when the driver had perhaps too much alcohol to drink?

28. How many drinks of alcoholic beverages do you have in a typical week?

NOTE:
1 Drink = 1 glass of wine = 1 can of beer = 1 shot of liquor

EXAMPLE: 2 DRINKS



IF YOU DON'T DRINK SKIP TO QUESTION 35

9. ☐ Yes ☐ No — **29. Have you ever felt you should cut down on your drinking?**

0. ☐ Yes ☐ No — **30. Have people ever annoyed you by criticizing your drinking?**

1. ☐ Yes ☐ No — **31. Have you ever felt bad or guilty about your drinking?**

2. ☐ Yes ☐ No — **32. Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (eye opener)?**

3. ☐ Yes ☐ No — **33. Do your friends ever worry about your drinking?**

4. ☐ Yes ☐ No — **34. Have you ever had a drinking problem?**

5. ☐ Yes ☐ No — **35. Have you ever been told that you have diabetes (or sugar diabetes)?**

6. ☐ Yes ☐ No — **36. Are you now taking medicine for high blood pressure?**

7. ☐ Daily or almost daily ☐ 3 to 5 days a week ☐ Less than 3 days a week ☐ Rarely or never — **37. How often do you eat two well-balanced meals per day?**

3. ☐ Daily or almost daily ☐ 3 to 5 days a week ☐ Less than 3 days a week ☐ Rarely or never — **38. How often do you eat foods high in salt or sodium such as cold cuts, bacon, canned soups, potato chips, etc...?**

9. ☐ Not Satisfied ☐ Somewhat Satisfied ☐ Mostly Satisfied ☐ Totally Satisfied ☐ Not Applicable — **39. I am satisfied with my present job assignment and unit.**

0. ☐ Money ☐ Social Life ☐ Family ☐ Supervisor ☐ Job ☐ Health ☐ No Problem — **40. What causes the biggest problem in your life?**

41. In the last year, how many serious personal losses or difficult problems have you had to handle (example, promotion passover, divorce/separation, legal or disciplinary action, bankruptcy, death of someone close, serious illness/injury of a loved one, etc.)?

41. ☐ Several ☐ Few ☐ Some ☐ None

42. In general, how satisfied are you with your life (e.g., work situation, social activity, accomplishing what you set out to do)?

42. ☐ Not Satisfied ☐ Somewhat Satisfied ☐ Mostly Satisfied ☐ Totally Satisfied

43. How often are there people available that you can turn to for support in bad moments or illness?

43. ☐ Never ☐ Hardly Ever ☐ Sometimes ☐ Always

44. How many hours of sleep do you usually get at night?

44. ☐ 5 Hours or less ☐ 6-8 Hours ☐ 9 Hours or more

45. Have you seriously considered suicide within the last two years?

45. ☐ Yes ☐ Yes, within the last year ☐ Yes, within the last 2 months ☐ No

46. How often do you have any serious problems dealing with your husband or wife, parents, friends or with your children?

46. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

47. How often did you experience a major pleasant change in the past year? (for example, promotion, marriage, birth, award, etc.)?

47. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

48. How often has life been so overwhelming in the last year that you seriously considered hurting yourself?

48. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

49. In the past year, how often have you experienced repeated or long periods of depression?

49. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

50. In the past year, how often have your worries interfered with your daily life?

50. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

51. How often are you able to find times to relax?

51. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

52. How often do you feel that your present work situation is putting you under too much stress?

52. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

TOBACCO USE HISTORY

53. How many cigars do you usually smoke per day?

53. 0 1 2 3 4 5 6 7 8 9

54. How many pipes of tobacco do you usually smoke per day?

54. 0 1 2 3 4 5 6 7 8 9

55. How many times per day do you usually use smokeless tobacco? (Chewing tobacco, snuff, pouches, etc.)

EXAMPLE: 20 times 0 1 2 3 4 5 6 7 8 9

55. 0 1 2 3 4 5 6 7 8 9

56. CIGARETTE SMOKING
How would you describe your cigarette smoking habits?

56. ☐ Never Smoked (SKIP TO QUESTION 58) ☐ Current Smoker ☐ Ex-Smoker

57. STILL SMOKE

a. How many cigarettes a day do you smoke?

USED TO SMOKE

b. How many years has it been since you smoked cigarettes fairly regularly?

c. What was the average number of cigarettes you smoked per day during the two years before you quit?

57.

a. NUMBER		b. YEARS		c. AVERAGE	
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6		6	6	6
7	7		7	7	7
8	8		8	8	8
9	9		9	9	9

58. About how long has it been since you had a rectal exam?

58. ☐ Less than 1 year ☐ 1 year ☐ 3 or more years ☐ 2 years ☐ Never

59. When was the last time you visited the dental clinic for a check-up?

59. ☐ Within the last year ☐ Between one and two years ago ☐ Over two years ago

CAR

WOMEN ONLY **WOMEN ONLY**

60. [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20]
60. At what age did you have your first menstrual period?

61. [0] No Children [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] [50]
61. How old were you when your first child was born?

62. ☐ Less than 1 year ☐ 1 year ☐ 2 years ☐ 3 or more years ☐ Never
62. How long has it been since your last breast X-ray (Mammogram)?

63. [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
63. How many women in your natural family (mother and sisters only) have had breast cancer?

64. ☐ Yes ☐ No ☐ Don't know
64. Have you had a hysterectomy operation? (removal of the uterus)

65. ☐ Less than 1 year ☐ 1 year ☐ 2 years ☐ 3 or more years ☐ Never
65. How long has it been since you had a pap smear for cancer?

66. ☐ Monthly ☐ Rarely/Never ☐ Every few months
66. How often do you examine your breasts for lumps?

67. ☐ Less than 1 year ☐ 1 year ☐ 2 years ☐ 3 or more years ☐ Never
67. About how long has it been since you had your breasts examined by a physician or nurse?

MEN ONLY **MEN ONLY**

68. ☐ Less than 1 year ☐ 1 year ☐ 2 years ☐ 3 or more years ☐ Never
68. About how long has it been since you had a prostate (rectal) exam?

69. ☐ Monthly ☐ Rarely/Never ☐ Every few months
69. How often do you do a testicular (sex organs) self exam?

Questions 70 - 75 should be completed by MEDICAL PERSONNEL ONLY.

70. TOTAL CHOL [0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
70. Blood Lipids Total Cholesterol (mg/dl)

71. HDL CHOL [0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
71. Blood Lipids HDL Cholesterol (mg/dl)

72. 12 HR. FAST [0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
72. Blood Glucose 12 Hr. Fasting (mg %)

73. B.P.-SYSTOLIC [0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
73. Blood Pressure (Systolic)

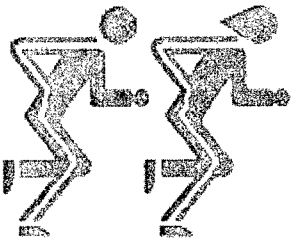
74. B.P.-DIASTOLIC [0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
74. Blood Pressure (Diastolic)

75. ☐ NL ☐ ABN w/LVH ☐ ABN w/o LVH ☐ UNKNOWN
75. Most recent electrocardiogram results.

X1. [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
X2. [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
X3. [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
X4. [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
X5. [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
X6. [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
X7. [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
X8. [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]

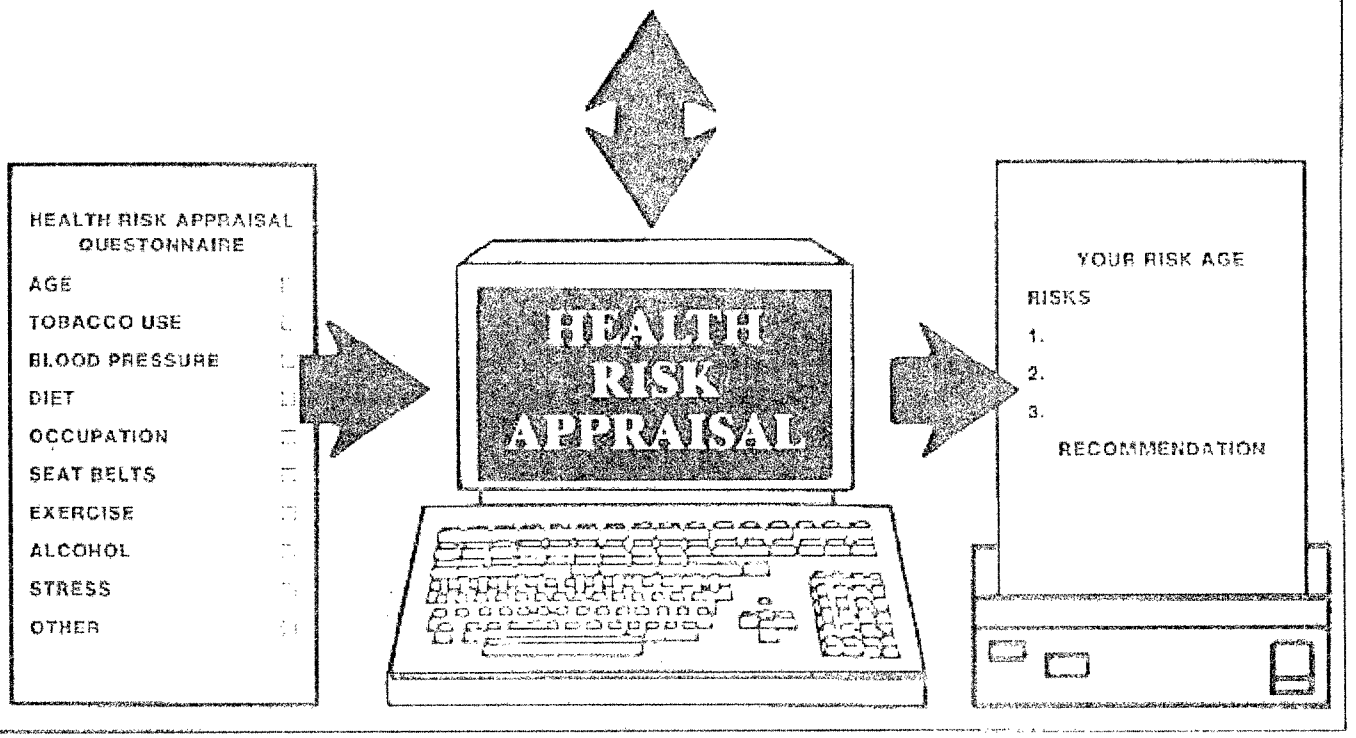
THE HEALTH PROMOTION PROGRAM

Fit to Win



HEALTH RISK APPRAISAL

DEATH STATISTICS	**DATA ON DISEASES**	**OCCUPATIONAL RISK DATA**
HOSPITAL DATA	**BEHAVIORAL RISK SURVEY DATA**	**U.S. CENSUS DATA**



For use of this form, see AR40-501 and AR600-63; the proponent agency is TSG

DA Form 5675, 1 Feb 92 (Edition of Oct 90 is obsolete)

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Therefore, your health risk appraisal report includes your real age, your current risk age and your target risk age. Your current risk age tells you how healthy your lifestyle is right now, and your target risk age lets you know how much longer and healthier you can live with a few positive changes in your lifestyle.

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IMPORTANT NOTE! The health risk appraisal is no substitute for a physical examination or check-up. It will not give you a diagnosis nor will it tell you how long you will actually live. However, the health risk appraisal will help you understand and recognize your risk factors.

the response boxes completely
EXAMPLE: Correct ■ Incorrect ☒ ⊘

the proponent is TSG

1. What is your branch of service?

1. ☐ U.S. Army ☐ U.S. Marines
☐ U.S. Navy ☐ U.S. Coast Guard
☐ U.S. Air Force ☐ Other

2. What is your military status?

2. ☐ Active ☐ Reserve
☐ Active Reserve ☐ Guard
☐ Active Guard ☐ Other

3. What is your current rank?

3.

ENLISTED		OFFICER		WARR. OFFIC.
☐ E-1	☐ E-6	☐ O-1	☐ O-6	☐ WO 1
☐ E-2	☐ E-7	☐ O-2	☐ O-7	☐ WO 2
☐ E-3	☐ E-8	☐ O-3	☐ O-8	☐ WO 3
☐ E-4	☐ E-9	☐ O-4	☐ O-9	☐ WO 4
☐ E-5		☐ O-5	☐ O-10	

4. What is your Unit Identification Code? (Enter Specific Unit Identifier)

Print your Unit Identification Code in these blank boxes. →

Then fill in the corresponding response box below each number/letter.

4.

UNIT CODE

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Mark ALL categories applicable to you.

- Retiree
- Spouse or Daughter of Active Duty or Military Retiree
- DOD Employee
- Non-DOD Employee
- Other

6. If you are a Civilian Government Employee, enter your categor and current pay grade.

6.	WG	GS	SES	GM
	1	6	11	16
	2	7	12	17
	3	8	13	18
	4	9	14	
	5	10	15	

7. LAST NAME FI

7. Your Name.

Print the first ten letters of your last name and your first initia in these blank boxes.

Then fill in the corresponding response box below each letter

8. AD or RM
- Spouse of AD or RM
- 1st 2nd 3rd 4th 5th Child
- Not Applicable

8. ARE YOU: (Mark ALL applicable categories)

Active Duty or Retired Military
Spouse of Active Duty or Retired Military
1st, 2nd, 3rd, 4th, or 5th child of Active Duty or Retired Military
Not Applicable

9. YOUR SPONSOR'S SOCIAL SECURITY NUMBER OR YOUR SOCIAL SECURITY NUMBER

9. Print your SSN in the blank boxes. Then fill in the correspondin response box below each number.
- If ACTIVE DUTY or RETIRED military, enter your SSN
- If a FAMILY MEMBER OF active duty or retired, enter sponsors SSN
- For ALL OTHERS, enter your SSN

(Privacy Act Statement Applies)

situation.

- Pre-Prepare Fitness Test
- Walking
- Other

11. Racial/Ethnic Background
Mark the most appropriate category.

11.
- American Indian or Alaska Native
- Asian/Oriental
- White, Hispanic
- Black, Hispanic
- White, Non Hispanic
- Black, Non Hispanic
- Other
- Multiracial

12. Marital Status.
Mark the most appropriate category.

12.
- Married
- Separated
- Never Married
- Widowed
- Divorced
- Other

13.
- MALE
- FEMALE

14. Your Age 15. Your Height 16. Your Weight

BEFORE you fill in the response boxes write age, height, and weight at the top of the columns.

EXAMPLE:
HEIGHT = 6 feet-0 inches
(Must enter if 0 inches)

HEIGHT	
FEET	INCHES
6	0

14. AGE (YEARS) 15. HEIGHT (FEET, INCHES) 16. WEIGHT (POUNDS)

17. What is your Body Frame Size?

17.
- Small
- Medium
- Large

18. How often do you do exercises that improve muscle strength, such as pushups, situps, weight lifting, a Nautilus/Universal workout, resistance training, etc...?

18.
- 3 or more times a week
- 1 or 2 times a week
- Rarely or never

19. How often do you do at least 20 minutes of non-stop aerobic activity (vigorous exercise that greatly increases your breathing and heart rate such as running, fast walking, biking, swimming, rowing, etc...)?

19.
- 3 or more times a week
- 1 or 2 times a week
- Rarely or never

20. How often do you eat high fiber foods such as whole grain breads, cereals, bran, raw fruit, or raw vegetables?

20.
- At every meal
- Daily
- 3-6 days a week
- Less than 3 days a week
- Rarely or never

21. How often do you eat foods high in saturated fats such as beef, hamburger, pork, sausage, butter, whole milk, cheese, etc...?

21.
- At every meal
- Daily
- 3-6 days a week
- Less than 3 days a week
- Rarely or never

22. Do you usually salt your food before tasting?

22.
- YES
- NO

will you travel by car, truck or van?

will you travel by motorcycle?

NOTE: U.S. average for cars is 10,000 miles

24. ☐ Walk ☐ Sub/Compact Car ☐ Truck/Van
☐ Bike ☐ Mid or Full Car ☐ Stay at Home
☐ Motorcycle ☐ Bus/Subway/Train

24. On a typical day how do you usually travel? (Mark only one)

25. ☐☐☐

25. What percent of the time do you usually buckle your safety belt when driving or riding?

EXAMPLE: 50%

26. ☐ Within 5 MPH of limit ☐ 11-15 MPH Over
☐ 6-10 MPH Over ☐ More than 15 MPH Over
☐ Don't Drive

26. On the average, how close to the speed limit do you usually drive?

27. NO. OF TIMES ☐☐

28. NO. OF DRINKS ☐☐

27. How many times in the last month did you drive or ride when the driver had perhaps too much alcohol to drink?

28. How many drinks of alcoholic beverages do you have in a typical week?

NOTE:
1 Drink = 1 glass of wine or wine cooler, 1 can of beer, 1 shot of liquor, 1 mixed drink

EXAMPLE: 2 DRINKS

0	2

29. ☐ Yes ☐ No — 29. Have you ever felt you should cut down on your drinking?

30. ☐ Yes ☐ No — 30. Have people ever annoyed you by criticizing your drinking?

31. ☐ Yes ☐ No — 31. Have you ever felt bad or guilty about your drinking?

32. ☐ Yes ☐ No — 32. Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (eye opener)?

33. ☐ Yes ☐ No — 33. Do your friends ever worry about your drinking?

34. ☐ Yes ☐ No — 34. Have you ever had a drinking problem?

35. ☐ Yes ☐ No — 35. Have you ever been told that you have diabetes (or sugar diabetes)

36. ☐ Yes ☐ No — 36. Are you now taking medicine for high blood pressure?

37. ☐ Daily or almost daily
☐ 3 to 5 days a week
☐ Less than 3 days a week
☐ Rarely or never

37. How often do you eat two well-balanced meals per day?

38. ☐ Daily or almost daily
☐ 3 to 5 days a week
☐ Less than 3 days a week
☐ Rarely or never

38. How often do you eat foods high in salt or sodium such as cold cuts, bacon, canned soups, potato chips, etc...?

39. ☐ Not Satisfied ☐ Somewhat Satisfied ☐ Mostly Satisfied ☐ Totally Satisfied ☐ Not Applicable

39. I am satisfied with my present job assignment and unit.

40. ☐ Money ☐ Supervisor ☐ No Problem
☐ Social Life ☐ Job
☐ Family ☐ Health

40. What causes the biggest problem in your life?

(Privacy Act Statement Applies)

divorce/separation, legal or disciplinary action, bankruptcy, death of someone close, serious illness/injury of a loved one, etc.)?

42. In general, how satisfied are you with your life (e.g., work situation, social activity, accomplishing what you set out to do)?
42. ☐ Not Satisfied ☐ Somewhat Satisfied ☐ Mostly Satisfied ☐ Totally Satisfied

43. How often are there people available that you can turn to for support in bad moments or illness?
43. ☐ Never ☐ Hardly Ever ☐ Sometimes ☐ Always

44. How many hours of sleep do you usually get at night?
44. ☐ 5 Hours or less ☐ 6-8 Hours ☐ 9 Hours or more

45. Have you seriously considered suicide within the last two years?
45. ☐ Yes ☐ Yes, within the last year ☐ Yes, within the last 3 months ☐ No

46. How often do you have any serious problems dealing with your husband or wife, parents, friends or with your children?
46. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

47. How often did you experience a major pleasant change in the past year? (for example, promotion, marriage, birth, award, etc.)?
47. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

48. How often has life been so overwhelming in the last year that you seriously considered hurting yourself?
48. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

49. In the past year, how often have you experienced repeated or long periods of depression?
49. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

50. In the past year, how often have your worries interfered with your daily life?
50. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

51. How often are you able to find times to relax?
51. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

52. How often do you feel that your present work situation is putting you under too much stress?
52. ☐ Often ☐ Sometimes ☐ Seldom ☐ Never

TOBACCO USE HISTORY

53. How many cigars do you usually smoke per day?
53. ☐☐☐

54. How many pipes of tobacco do you usually smoke per day?
54. ☐☐☐

55. How many times per day do you usually use smokeless tobacco? (Chewing tobacco, snuff, pouches, etc.)
55. ☐☐☐

EXAMPLE: 20 times

56. CIGARETTE SMOKING
How would you describe your cigarette smoking habits?
56. ☐ Never Smoked (SKIP TO QUESTION 58) ☐ Current Smoker ☐ Ex-Smoker

57. STILL SMOKE
a. How many cigarettes a day do you smoke?

USED TO SMOKE
b. How many years has it been since you smoked cigarettes fairly regularly?

c. What was the average number of cigarettes you smoked per day during the two years before you quit?

57. a. NUMBER b. YEARS c. AVERAGE

a. NUMBER	b. YEARS	c. AVERAGE
☐☐	☐☐	☐☐
☐☐	☐☐	☐☐
☐☐	☐☐	☐☐
☐☐	☐☐	☐☐
☐☐	☐☐	☐☐
☐☐	☐☐	☐☐
☐☐	☐☐	☐☐
☐☐	☐☐	☐☐
☐☐	☐☐	☐☐
☐☐	☐☐	☐☐

58. About how long has it been since you had a rectal exam?
58. ☐ Less than 1 year ☐ 1 year ☐ 2 or more years ☐ 3 years ☐ Never

59. When was the last time you visited the dental clinic for a check-up?
59. ☐ Within the last year ☐ Between one and two years ago ☐ Over two years ago

No Children Never

61. How old were you when your first child was born?

62. How long has it been since your last breast X-ray (Mammogram)?

Less than 1 year
1 year
2 years
3 or more years
Never

63. How many women in your natural family (mother and sisters only) have had breast cancer?

64. Have you had a hysterectomy operation? (removal of the uterus)
Yes No Don't know

65. How long has it been since you had a pap smear for cancer?
Less than 1 year
1 year
2 years
3 or more years
Never

66. How often do you examine your breasts for lumps?
Monthly Rarely/Never Every few months

67. About how long has it been since you had your breasts examined by a physician or nurse?
Less than 1 year
1 year
2 years
3 or more years
Never

68. About how long has it been since you had a prostate (rectal) exam?
Less than 1 year
1 year
2 years
3 or more years
Never

69. How often do you do a testicular (sex organs) self exam?
Monthly Rarely/Never Every few months

70. TOTAL CHOL

71. HDL CHOL

72. 12 HR. FAST

70. Blood Lipids Total Cholesterol (mg/dl)

71. Blood Lipids HDL Cholesterol (mg/dl)

72. Blood Glucose 12 Hr. Fasting (mg %)

73. B.P.-SYSTOLIC

74. B.P.-DIASTOLIC

73. Blood Pressure (Systolic)

74. Blood Pressure (Diastolic)

75. Most recent electrocardiogram results.
NL
ABN w/o LVH
ABN w/LVH
UNKNOWN

(1.
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Appendix G

The Health Enrollment Assessment Review (HEAR)

HEAR 2.1

Release date: September 18, 1998

Welcome to the Health Evaluation and Assessment Review (HEAR 2.1) questionnaire. Please read each question carefully and follow the instructions. If you have any problems or questions, ask the administrator to assist you. The PRIVACY ACT STATEMENT is displayed on the last page

BEGIN HEAR 2.1 QUESTIONNAIRE

GENERAL INFORMATION

Q1 Gender

- ☐ Male ..... *[2]*
- ☐ Female ..... *[3]*

Q2 Current marital status

- ☐ Single, never married ..... *[4]*
- ☐ Married ..... *[5]*
- ☐ Divorced ..... *[18]*
- ☐ Separated ..... *[19]*
- ☐ Widowed ..... *[7]*
- ☐ Member unmarried couple ..... *[669]*

Q3 Component (Check all that apply)

- ☐ Active duty ..... *[8]*
- ☐ Civilian government employee ..... *[9]*
- ☐ Family member ..... *[10]*
- ☐ National Guard ..... *[11]*
- ☐ Non-government employee ..... *[12]*
- ☐ Reserves ..... *[13]*
- ☐ Retired military ..... *[17]*
- ☐ Other ..... *[14]*

Q4 Is your spouse also Active Duty, Guard or Reserve?

- ☐ Yes ..... *[15]*
- ☐ No ..... *[16]*
- ☐ Not applicable ..... *[n/a]*

Q5 Are you currently: (Check all that apply)

- ☐ Employed for wages ..... *[50]*
- ☐ Self employed ..... *[51]*
- ☐ Out of work for less than 1 year ..... *[670]*
- ☐ Out of work for more than 1 year ..... *[52]*
- ☐ Homemaker ..... *[53]*
- ☐ Student ..... *[54]*
- ☐ Retired ..... *[55]*
- ☐ Unable to work ..... *[56]*

Q6 What is the highest grade or year of school you completed?

- ☐ Grade school ..... *[66]*
- ☐ Some high school ..... *[67]*
- ☐ High school diploma or equivalent ..... *[68]*
- ☐ Some college ..... *[69]*
- ☐ College degree ..... *[70]*
- ☐ Some post graduate ..... *[71]*
- ☐ Postgraduate degree ..... *[72]*

Q7 Estimate your total annual household income from all sources

- ☐ < $10,000 ..... *[73]*
- ☐ $10,000 to < $15,000 ..... *[74]*
- ☐ $15,000 to < $20,000 ..... *[75]*
- ☐ $20,000 to < $25,000 ..... *[76]*
- ☐ $25,000 to < $35,000 ..... *[77]*
- ☐ $35,000 to < $50,000 ..... *[78]*
- ☐ $50,000 to < $75,000 ..... *[79]*
- ☐ $75,000 or more ..... *[80]*

Q8 Do you have children living in your household?

- ☐ Yes ..... *[690]*
- ☐ No (skip to Q10) ..... *[24]*

Q9 Children - Instructions

You have indicated that you have children living at home. On the next 5 questions, please indicate the number of children

currently living in your household in each of the proper age ranges.

Q9a How many children ages 0-2 living at home?

- ☐ 1 child ..... *[25]*
- ☐ 2 children ..... *[26]*
- ☐ 3 children ..... *[27]*
- ☐ More than 3 children ..... *[28]*
- ☐ *No children ages 0-2* ..... *[Q16]*

Q9b How many children ages 3-5 living at home?

- ☐ 1 child ..... *[30]*
- ☐ 2 children ..... *[31]*
- ☐ 3 children ..... *[32]*
- ☐ More than 3 children ..... *[33]*
- ☐ *No children ages 3-5* ..... *[Q17]*

Q9c How many children ages 6-10 living at home?

- ☐ 1 child ..... *[35]*
- ☐ 2 children ..... *[36]*
- ☐ 3 children ..... *[37]*
- ☐ More than 3 children ..... *[38]*
- ☐ *No children ages 6-10* ..... *[Q18]*

Q9d How many children ages 11-13 living at home?

- ☐ 1 child ..... *[40]*
- ☐ 2 children ..... *[41]*
- ☐ 3 children ..... *[42]*
- ☐ More than 3 children ..... *[43]*
- ☐ *No children ages 11-13* ..... *[Q19]*

Q9e How many children older than 13 living at home?

- ☐ 1 child ..... *[45]*
- ☐ 2 children ..... *[46]*
- ☐ 3 children ..... *[47]*
- ☐ More than 3 children ..... *[48]*
- ☐ *No children older than 13* ..... *[Q26]*

OVERALL HEALTH & ACTIVITIES

Q10 Would you say your health in general is...

- ☐ Excellent ..... *[81]*
- ☐ Very good ..... *[82]*
- ☐ Good ..... *[83]*
- ☐ Fair ..... *[84]*
- ☐ Poor ..... *[85]*

Q11 Are you limited in the kind or amount of work or leisure activity you can do because of any impairment or health problem?

- ☐ Yes ..... *[86]*
- ☐ No (skip to Q14) ..... *[87]*

Q12 Do you have difficulty walking, such as hobbling, shuffling, or not being able to walk a straight line?

- ☐ Yes ..... *[88]*
- ☐ No ..... *[89]*

Q13 Activities - Instructions

On the following questions, indicate if you have no difficulty, some difficulty, much difficulty, or are unable to perform the activities listed at all when you are by yourself and without the use of aids.

Q13a Walking about 2 to 3 blocks

- ☐ No difficulty ..... *[90]*
- ☐ Some difficulty ..... *[91]*
- ☐ Much difficulty ..... *[92]*
- ☐ Unable to do ..... *[93]*

Q13b Walking up 10 steps without resting

- ☐ No difficulty ..... *[94]*
- ☐ Some difficulty ..... *[95]*
- ☐ Much difficulty ..... *[96]*
- ☐ Unable to do ..... *[97]*

Q13c Stooping, crouching, or kneeling

- ☐ No difficulty ..... *[98]*
- ☐ Some difficulty ..... *[99]*
- ☐ Much difficulty ..... *[100]*
- ☐ Unable to do ..... *[101]*

Q13d Lifting or carrying something as heavy as 10 pounds (like a sack of potatoes or rice)

- ☐ No difficulty ..... *[102]*
- ☐ Some difficulty ..... *[103]*
- ☐ Much difficulty ..... *[104]*
- ☐ Unable to do ..... *[105]*

Q14 During the past two weeks, how many days did you stay in bed for more than half of the day because of illness or injury?

- ☐ None ..... *[106]*
- ☐ 1-2 days ..... *[107]*
- ☐ 3-4 days ..... *[108]*
- ☐ 5-6 days ..... *[109]*
- ☐ 7 or more days ..... *[110]*
- ☐ Don't know ..... *[111]*

Q15 During the past two weeks, how many days did you miss more than half the day from your job or usual activities (such as housework or school) because of illness or injury?

- ☐ None ..... *[112]*
- ☐ 1-2 days ..... *[113]*
- ☐ 3-4 days ..... *[114]*
- ☐ 5-6 days ..... *[115]*
- ☐ 7 or more days ..... *[116]*
- ☐ Don't know ..... *[117]*

DENTAL HEALTH

Q16 How long has it been since you last visited a dentist or other dental health professional for a routine checkup or cleaning?

- ☐ Within the past year ..... *[118]*
- ☐ 1-2 years ago ..... *[119]*
- ☐ 3-5 years ago ..... *[120]*
- ☐ Over 5 years ago ..... *[121]*
- ☐ Never ..... *[122]*
- ☐ Don't know ..... *[123]*

Q17 Do your gums bleed when you brush your teeth?

- ☐ Yes ..... *[124]*
- ☐ No ..... *[125]*

CLINIC AND EMERGENCY ROOM VISITS

Q18 During the past 12 months, how often did you visit a Clinic, excluding visits for pregnancy, medication refills, dentist?

- ☐ No visits to a civilian or military provider .... *[126]*
- ☐ 1-5 visits to a civilian or military provider ... *[127]*
- ☐ 6-10 visits to a civilian or military provider . *[128]*
- ☐ 11-15 visits to a civilian or military provider *[129]*
- ☐ 16-20 visits to a civilian or military provider *[130]*
- ☐ 21 or more visits to a civilian or military provider ..... *[131]*
- ☐ Don't know ..... *[132]*

Q19 During the past 12 months, how many times have you gone to the Emergency Room or Urgent Care Clinic due to an illness or injury you had?

- ☐ None ..... *[133]*
- ☐ 1-2 times ..... *[134]*
- ☐ 3-4 times ..... *[135]*
- ☐ 5-6 times ..... *[136]*
- ☐ 7 or more times ..... *[137]*
- ☐ Don't know ..... *[138]*

Q20 During the past 12 months, how many different times did you stay in any hospital overnight or longer?

- ☐ None ..... *[139]*
- ☐ 1 time ..... *[140]*
- ☐ 2 or 3 times ..... *[141]*
- ☐ 4 or more times ..... *[142]*
- ☐ Don't know ..... *[143]*

Q21 Altogether, during the past 12 months, how many nights did you spend in the hospital?

- ☐ 1-2 nights ..... *[145]*
- ☐ 3-4 nights ..... *[146]*
- ☐ 5-6 nights ..... *[147]*
- ☐ 7 or more nights ..... *[148]*
- ☐ Don't know ..... *[149]*

CHRONIC DISEASES OR CONDITIONS

Q22 Has a doctor or other health professional ever told you that you had: CHRONIC HEADACHES

- ☐ Yes ..... *[150]*
- ☐ No ..... *[151]*
- ☐ Don't know ..... *[152]*

Q23 Has a doctor or other health professional ever told you that you had: EPILEPSY, SEIZURES, BRAIN INJURY, ALZHEIMER'S DISEASE, PARKINSON'S DISEASE OR ANY OTHER NEUROLOGIC DISEASE.

- ☐ Yes ..... *[153]*
- ☐ No ..... *[154]*
- ☐ Don't know ..... *[155]*

Q24 Has a doctor or other health professional ever told you that you had: ASTHMA

- ☐ Yes ..... *[156]*
- ☐ No ..... *[157]*
- ☐ Don't know ..... *[158]*

Q25 Has a doctor or other health professional ever told you that you had: CHRONIC BRONCHITIS/EMPHYSEMA

- ☐ Yes ..... *[159]*
- ☐ No ..... *[160]*
- ☐ Don't know ..... *[161]*

Q26 Has a doctor or other health professional ever told you that you had: DIABETES

- ☐ Yes ..... *[162]*
- ☐ No ..... *[163]*
- ☐ Don't know ..... *[164]*

Q27 Has a doctor or other health professional ever told you that you had: KIDNEY DISEASE

- ☐ Yes ..... *[165]*
- ☐ No ..... *[166]*
- ☐ Don't know ..... *[167]*

Q28 Has a doctor or other health professional ever told you that you had: LIVER DISEASE

- ☐ Yes ..... *[168]*
- ☐ No ..... *[169]*
- ☐ Don't know ..... *[170]*

Q29 Has a doctor or other health professional ever told you that you had: STOMACH ULCER

- ☐ Yes ..... *[171]*
- ☐ No ..... *[172]*
- ☐ Don't know ..... *[173]*

Q30 Has a doctor or other health professional ever told you that you had: CANCER

- ☐ Yes ..... *[174]*
- ☐ No ..... *[175]*
- ☐ Don't know ..... *[176]*

Q31 Has a doctor or other health professional ever told you that you had: STROKE

- ☐ Yes ..... *[177]*
- ☐ No ..... *[178]*
- ☐ Don't know ..... *[179]*

Q32 Has a doctor or other health professional ever told you that you had: HEART DISEASE OR ANGINA

- ☐ Yes ..... *[180]*
- ☐ No ..... *[181]*
- ☐ Don't know ..... *[182]*

Q33 Has a doctor or other health professional ever told you that you had: HEART FAILURE

- ☐ Yes ..... *[183]*
- ☐ No ..... *[184]*
- ☐ Don't know ..... *[185]*

Q34 Has a doctor or other health professional ever told you that you had: HEART ATTACK

- ☐ Yes ..... *[186]*
- ☐ No ..... *[187]*
- ☐ Don't know ..... *[188]*

Q35 Has a doctor or other health professional ever told you that you had: HIV or AIDS

- ☐ Yes ..... *[189]*
- ☐ No ..... *[190]*
- ☐ Don't know ..... *[191]*

Q36 Has a doctor or other health professional ever told you that you had: ARTHRITIS

- ☐ Yes ..... *[192]*
- ☐ No ..... *[193]*
- ☐ Don't know ..... *[194]*

Q37 Has a doctor or other health professional ever told you that you had: CUMULATIVE TRAUMA DISORDER (such as Carpal Tunnel Syndrome)

- ☐ Yes ..... *[195]*
- ☐ No ..... *[196]*
- ☐ Don't know ..... *[197]*

Q38 Has a doctor or other health professional ever told you that you had: CHRONIC MUSCLE, JOINT OR BACK PROBLEMS

- ☐ Yes ..... *[198]*
- ☐ No ..... *[199]*
- ☐ Don't know ..... *[200]*

Q39 Have you ever been told by a provider that you have: DEPRESSION

- ☐ Yes ..... *[636]*
- ☐ No ..... *[637]*
- ☐ Don't know ..... *[685]*

Q40 Have you ever been told by a provider that you have: ADJUSTMENT DISORDER

- ☐ Yes ..... *[638]*
- ☐ No ..... *[639]*
- ☐ Don't know ..... *[686]*

Q41 Have you ever been told by a provider that you have: ANXIETY

- ☐ Yes ..... *[640]*
- ☐ No ..... *[641]*
- ☐ Don't know ..... *[687]*

Q42 Have you ever been told by a provider that you have: PERSONALITY DISORDER

- ☐ Yes ..... *[642]*
- ☐ No ..... *[643]*
- ☐ Don't know ..... *[688]*

EXERCISE AND FITNESS

Q43 In an average week, how many times do you engage in physical activity (exercise or work) which lasts at least 20 minutes without stopping and which is hard enough to make you breathe heavier and your heart beat faster?

- ☐ Less than 1 time ..... *[201]*
- ☐ 1-2 times ..... *[202]*
- ☐ At least 3 times ..... *[203]*

Q44 In an average week, how many times do you get 30 minutes or more of at least moderate exercise over the course of the entire day?

- ☐ Less than 1 time ..... *[204]*
- ☐ 1-2 times ..... *[205]*
- ☐ At least 3 times ..... *[206]*

Q45 How much hard, physical work is required as part of your main activity, such as your job, keeping your home, being a student, and so on?

- ☐ A great deal ..... *[207]*
- ☐ A moderate amount ..... *[208]*
- ☐ A little ..... *[209]*
- ☐ None ..... *[210]*

Q46 In an average week, how often do you do exercises that improve muscle strength, such as pushups, sit-ups, weight training, Nautilus or Universal workouts, or resistance training?

- ☐ Less than 1 time ..... *[211]*
- ☐ 1-2 times ..... *[212]*
- ☐ At least 3 times ..... *[213]*

Q47 In an average week, how often do you do exercises that improve flexibility, such as stretching?

- ☐ Less than 1 time ..... *[214]*
- ☐ 1-2 times ..... *[215]*
- ☐ At least 3 times ..... *[216]*

NUTRITION

Q48 On an average day, how many servings of fruit and vegetables do you eat?

- ☐ None ..... *[217]*
- ☐ 1-2 servings ..... *[218]*
- ☐ 3-4 servings ..... *[219]*
- ☐ 5 or more servings ..... *[220]*

Q49 How often do you eat foods such as beef, hamburger, pork, sausage, fried foods, cheese, or butter?

- ☐ At every meal ..... *[221]*
- ☐ Daily ..... *[222]*
- ☐ 1-2 days a week ..... *[223]*
- ☐ 3-5 days a week ..... *[224]*
- ☐ Rarely or never ..... *[225]*

Q50 How often do you eat foods such as whole grain breads, cereals, bran, raw fruit, or raw vegetables?

- ☐ At every meal ..... *[226]*
- ☐ Daily ..... *[227]*
- ☐ 1-2 days a week ..... *[228]*
- ☐ 3-5 days a week ..... *[229]*
- ☐ Rarely or never ..... *[230]*

Q51 How often do you eat foods such as cheese, yogurt, or milk?

- ☐ At every meal ..... *[231]*
- ☐ Daily ..... *[232]*
- ☐ 1-2 days a week ..... *[233]*
- ☐ 3-5 days a week ..... *[234]*
- ☐ Rarely or never ..... *[235]*

Q52 Do you eat a wide variety of foods in your overall diet, including a variety of foods from all five main food groups? (bread/cereal/rice/pasta group, fruit group, vegetable group, and milk/yogurt/cheese group)

- ☐ Yes ..... *[236]*
- ☐ No ..... *[237]*
- ☐ Don't know ..... *[238]*

TOBACCO USE

Q53 Have you smoked at least one hundred cigarettes in your entire life?

- ☐ Yes ..... *[691]*
- ☐ No (skip to Q66) ..... *[239]*

Q54 Do you now smoke cigarettes...

- ☐ Every day ..... *[692]*
- ☐ Some days (skip to Q57) ..... *[693]*
- ☐ Not at all (skip to Q60) ..... *[694]*

Q55 All together, for how many years have you been a regular smoker, not including the years that you have quit?

- ☐ Less than 1 year ..... *[240]*
- ☐ 1-2 years ..... *[241]*
- ☐ 3-5 years ..... *[242]*
- ☐ 6-10 years ..... *[243]*
- ☐ 11-15 years ..... *[244]*
- ☐ 16-20 years ..... *[245]*
- ☐ More than 20 years ..... *[246]*

Q56 On average, how many cigarettes do you smoke a day?

- ☐ Less than 1 cigarette a day ..... *[247]*
- ☐ 1-10 cigarettes a day (half a pack) ..... *[248]*
- ☐ 11-20 cigarettes a day (1 pack) ..... *[249]*
- ☐ 21-30 cigarettes a day (1 and a half packs) *[250]*
- ☐ 31-40 cigarettes a day (2 packs) ..... *[251]*
- ☐ More than 40 cigarettes a day (more than 2 packs) ..... *[252]*

PLEASE GO TO Q63

OCCASIONAL SMOKERS

Q57 On how many of the past 30 days did you smoke cigarettes?

- ☐ None ..... *[253]*
- ☐ 1-5 days ..... *[254]*
- ☐ 6-10 days ..... *[255]*
- ☐ 11-15 days ..... *[256]*
- ☐ 16-20 days ..... *[257]*
- ☐ 21-25 days ..... *[258]*
- ☐ 26-30 days ..... *[259]*
- ☐ Don't know ..... *[260]*

Q58 On the average, when you smoked during the past 30 days, about how many cigarettes did you smoke each day?

- ☐ Less than 1 cigarette a day ..... *[247]*
- ☐ 1-10 cigarettes a day (half a pack) ..... *[248]*
- ☐ 11-20 cigarettes a day (1 pack) ..... *[249]*
- ☐ 21-30 cigarettes a day (1 and a half packs) *[250]*
- ☐ 31-40 cigarettes a day (2 packs) ..... *[251]*
- ☐ More than 40 cigarettes a day (more than 2 packs) ..... *[252]*

Q59 All together, for how many years have you smoked cigarettes, not including the years that you have quit?

- ☐ Less than 1 year ..... *[262]*
- ☐ 1-2 years ..... *[263]*
- ☐ 3-5 years ..... *[264]*
- ☐ 6-10 years ..... *[265]*
- ☐ 11-15 years ..... *[266]*
- ☐ 16-20 years ..... *[267]*
- ☐ More than 20 years ..... *[268]*

PLEASE GO TO Q63

EX-SMOKERS

Q60 How many years has it been since you last smoked cigarettes?

- ☐ Less than 1 year ..... *[276]*
- ☐ 1-2 years ..... *[277]*
- ☐ 3-5 years ..... *[278]*
- ☐ 6-10 years ..... *[279]*
- ☐ 11-15 years ..... *[280]*
- ☐ 16-20 years ..... *[281]*
- ☐ More than 20 years ..... *[282]*

Q61 All together, for how many years did you smoke cigarettes, not including the years that you had quit?

- ☐ Less than 1 year ..... *[283]*
- ☐ 1-2 years ..... *[284]*
- ☐ 3-5 years ..... *[285]*
- ☐ 6-10 years ..... *[286]*
- ☐ 11-15 years ..... *[287]*
- ☐ 16-20 years ..... *[288]*
- ☐ More than 20 years ..... *[289]*

Q62 During the years that you smoked, about how many cigarettes per day did you smoke?

- ☐ Less than 1 cigarette a day ..... *[290]*
- ☐ 1-10 cigarettes a day (half a pack) ..... *[291]*
- ☐ 11-20 cigarettes a day (1 pack) ..... *[292]*
- ☐ 21-30 cigarettes a day (1 and a half packs) *[293]*
- ☐ 31-40 cigarettes a day (2 packs) ..... *[294]*
- ☐ More than 40 cigarettes a day (more than 2 packs) ..... *[295]*

PLEASE GO TO Q66

Q63 Are you planning to quit smoking in the next month?

- ☐ Yes ..... *[269]*
- ☐ No ..... *[270]*
- ☐ Don't know ..... *[271]*

Q64 During the past 12 months, have you tried to quit smoking?

- ☐ Yes ..... *[272]*
- ☐ No ..... *[273]*

Q65 During the past 12 months, has a health care provider advised you to quit smoking or counseled you on quitting smoking?

- ☐ Yes ..... *[274]*
- ☐ No ..... *[275]*

Q66 Do you smoke cigars?

- ☐ Yes ..... *[695]*
- ☐ No (skip to Q68) ..... *[296]*

Q67 How many cigars do you usually smoke per day?

- ☐ Less than 1 cigar a day ..... *[297]*
- ☐ 1 cigar a day ..... *[298]*
- ☐ 2-3 cigars a day ..... *[299]*
- ☐ 4-5 cigars a day ..... *[300]*
- ☐ 6-7 cigars a day ..... *[301]*
- ☐ More than 7 cigars a day ..... *[302]*

Q68 Do you smoke pipes of tobacco?

- ☐ Yes ..... *[696]*
- ☐ No (skip to Q70) ..... *[303]*

Q69 How many pipes of tobacco do you usually smoke per day?

- ☐ Less than 1 pipe a day ..... *[304]*
- ☐ 1 pipe a day ..... *[305]*
- ☐ 2-3 pipes a day ..... *[306]*
- ☐ 4-5 pipes a day ..... *[307]*
- ☐ 6-7 pipes a day ..... *[308]*
- ☐ More than 7 pipes a day ..... *[309]*

Q70 Do you use smokeless tobacco?

- ☐ Yes ..... *[697]*
- ☐ No (skip to Q74) ..... *[310]*

Q71 How many times per day do you usually use smokeless tobacco?

- ☐ Less than 1 time a day ..... *[311]*
- ☐ 1 time a day ..... *[312]*
- ☐ 2-3 times a day ..... *[313]*
- ☐ 4-5 times a day ..... *[314]*
- ☐ 6-7 times a day ..... *[315]*
- ☐ More than 7 times a day ..... *[316]*

Q72 On the average, how many days per month do you use smokeless products?

- ☐ 1-5 days ..... *[317]*
- ☐ 6-10 days ..... *[318]*
- ☐ 11-15 days ..... *[319]*
- ☐ 16-20 days ..... *[320]*
- ☐ 21-25 days ..... *[321]*
- ☐ 26-30 days ..... *[322]*
- ☐ Don't know ..... *[323]*

Q73 All together, for how many years have you used smokeless products, not including the years you have quit?

- ☐ Less than 1 year ..... *[324]*
- ☐ 1-2 years ..... *[325]*
- ☐ 3-5 years ..... *[326]*
- ☐ 6-10 years ..... *[327]*
- ☐ 11-15 years ..... *[328]*
- ☐ 16-20 years ..... *[329]*
- ☐ More than 20 years ..... *[330]*

ALCOHOL

Q74 During the past 12 months, has a health care provider asked about your use of alcohol?

- ☐ Yes ..... *[331]*
- ☐ No ..... *[332]*

Q75 During the past 12 months, have you had a drink containing alcohol?

- ☐ Yes ..... *[698]*
- ☐ No (skip to Q88) ..... *[333]*

Q76 During the past 12 months, how often have you had a drink containing alcohol?

- ☐ Once a month or less ..... *[334]*
- ☐ 2-4 times per month ..... *[335]*
- ☐ 2-3 times per week ..... *[336]*
- ☐ 4 or more times per week ..... *[337]*

Q77 During the past 12 months, how many drinks have you had on an average day when you were drinking?

- ☐ 1 or 2 drinks ..... *[338]*
- ☐ 3 or 4 drinks ..... *[339]*
- ☐ 5 or 6 drinks ..... *[340]*
- ☐ 7 to 9 drinks ..... *[341]*
- ☐ 10 or more drinks ..... *[342]*

Alcohol Use - Instructions

On the next questions, indicate how often the following situations have happened to you during the past 12 months either while you were drinking alcohol or as a result of you drinking alcohol.

Q78 How often have you had 6 or more drinks on one occasion?

- ☐ Never in the past 12 months ..... *[343]*
- ☐ Less than monthly in the past 12 months .. *[344]*
- ☐ Monthly in the past 12 months ..... *[345]*
- ☐ Weekly in the past 12 months ..... *[346]*
- ☐ Daily or almost daily in the past 12 months *[347]*

Q79 How often have you found that you were unable to stop drinking once you had started?

- ☐ Never in the past 12 months ..... *[348]*
- ☐ Less than monthly in the past 12 months .. *[349]*
- ☐ Monthly in the past 12 months ..... *[350]*
- ☐ Weekly in the past 12 months ..... *[351]*
- ☐ Daily or almost daily in the past 12 months *[352]*

Q80 How often have you failed to do what was normally expected of you because you had been drinking?

- ☐ Never in the past 12 months..... *[353]*
- ☐ Less than monthly in the past 12 months.. *[354]*
- ☐ Monthly in the past 12 months..... *[355]*
- ☐ Weekly in the past 12 months ..... *[356]*
- ☐ Daily or almost daily in the past 12 months *[357]*

Q81 How often have you needed a first drink in the morning to get yourself going after a heavy drinking session?

- ☐ Never in the past 12 months..... *[358]*
- ☐ Less than monthly in the past 12 months.. *[359]*
- ☐ Monthly in the past 12 months..... *[360]*
- ☐ Weekly in the past 12 months ..... *[361]*
- ☐ Daily or almost daily in the past 12 months *[362]*

Q82 How often have you had a feeling of guilt or remorse after drinking?

- ☐ Never in the past 12 months..... *[363]*
- ☐ Less than monthly in the past 12 months.. *[364]*
- ☐ Monthly in the past 12 months..... *[365]*
- ☐ Weekly in the past 12 months ..... *[366]*
- ☐ Daily or almost daily in the past 12 months *[367]*

Q83 How often have you been unable to remember what happened the night before because you had been drinking?

- ☐ Never in the past 12 months..... *[368]*
- ☐ Less than monthly in the past 12 months.. *[369]*
- ☐ Monthly in the past 12 months..... *[370]*
- ☐ Weekly in the past 12 months ..... *[371]*
- ☐ Daily or almost daily in the past 12 months *[372]*

Q84 How often have you or someone else been injured as a result of your drinking?

- ☐ Never in the past 12 months..... *[373]*
- ☐ Less than monthly in the past 12 months.. *[374]*
- ☐ Monthly in the past 12 months..... *[375]*
- ☐ Weekly in the past 12 months..... *[376]*
- ☐ Daily or almost daily in the past 12 months *[377]*

Q85 During the past 12 months, has a relative, friend, doctor, or other health worker been concerned about your drinking or suggested you cut down?

- ☐ Yes..... *[378]*
- ☐ No ..... *[379]*
- ☐ Don't know ..... *[380]*

Q86 Have people annoyed you by criticizing your drinking?

- ☐ Yes..... *[381]*
- ☐ No ..... *[382]*

Q87 Have you ever felt you ought to cut down on your drinking?

- ☐ Yes..... *[383]*
- ☐ No ..... *[384]*

Q88 During the past month, how many times did you drive or ride when the driver had perhaps too much alcohol to drink?

- ☐ None ..... *[385]*
- ☐ 1-5 times ..... *[386]*
- ☐ 6-10 times ..... *[387]*
- ☐ 11-15 times ..... *[388]*
- ☐ 16-20 times ..... *[389]*
- ☐ 21-30 times ..... *[390]*
- ☐ Over 30 times ..... *[391]*

MEDICATION USE

Q89 Do you take prescription muscle relaxants regularly (3 times per week or more)?

- ☐ Yes ..... *[392]*
- ☐ No ..... *[393]*
- ☐ Don't know ..... *[394]*

Q90 Do you take prescription pain medications regularly (3 times per week or more)?

- ☐ Yes ..... *[395]*
- ☐ No ..... *[396]*
- ☐ Don't know ..... *[397]*

Q91 How many different prescription medications are you currently taking?

- ☐ None ..... *[401]*
- ☐ 1-2 different medications ..... *[402]*
- ☐ 3-5 different medications ..... *[403]*
- ☐ 6 or more different medications ..... *[404]*
- ☐ Don't know ..... *[405]*

Q92 Do you take any over-the-counter, non-prescription medications (such as laxatives, antihistamines, or nose sprays) regularly (3 times per week or more)?

- ☐ Yes ..... *[398]*
- ☐ No ..... *[399]*
- ☐ Don't know ..... *[400]*

FAMILY HISTORY

Q93 Including living and deceased, were any of your blood relatives (including grandparents, parents, brothers, sisters) ever told by a health care provider that they had a HEART ATTACK before the age of 50? (to the best of your knowledge)

- ☐ Yes ..... *[406]*
- ☐ No ..... *[407]*
- ☐ Don't know ..... *[408]*

Q94 Including living and deceased, were any of your blood relatives (including grandparents, parents, brothers, sisters) ever told by a health care provider that they had DIABETES? (to the best of your knowledge)

- ☐ Yes ..... *[409]*
- ☐ No ..... *[410]*
- ☐ Don't know ..... *[411]*

Q95 Including living and deceased, were any of your immediate family (including father, mother, brothers, sisters) ever told by a health care provider that they had CANCER? (to the best of your knowledge)

- ☐ Yes ..... *[470]*
- ☐ No (skip to Q99) ..... *[471]*
- ☐ Don't know (skip to Q99) ..... *[472]*

WOMEN ONLY – MEN PLEASE GO TO Q99

Q96 How many women in your natural family (mother and sisters only) have had BREAST CANCER?

- ☐ None (skip to Q99) ..... *[496]*
- ☐ 1 family member ..... *[491]*
- ☐ 2 family members ..... *[492]*
- ☐ 3 family members ..... *[493]*
- ☐ 4 family members ..... *[494]*
- ☐ 5 or more family members ..... *[495]*
- ☐ Don't know (skip to Q99) ..... *[497]*

Q97 To the best of your knowledge, were any of these women diagnosed with breast cancer before the age of 50?

- ☐ Yes ..... *[498]*
- ☐ No ..... *[499]*
- ☐ Don't know ..... *[500]*

Q98 To the best of your knowledge, did any of these women have breast cancer in both breasts?

- ☐ Yes ..... *[502]*
- ☐ No ..... *[503]*
- ☐ Don't know ..... *[504]*

HYPERTENSION

Q99 About how long has it been since you last had your blood pressure taken by a doctor, nurse, or other health care provider?

- ☐ Within the past year ..... *[412]*
- ☐ 1-2 years ago ..... *[413]*
- ☐ More than 2 years ago ..... *[414]*
- ☐ Never (skip to Q101) ..... *[415]*
- ☐ Don't know ..... *[416]*

Q100 At that time, did the doctor or health professional say that your blood pressure was...

- ☐ High ..... *[417]*
- ☐ Borderline High ..... *[418]*
- ☐ Normal ..... *[419]*
- ☐ Don't know ..... *[420]*

Q101 Have you ever been told by a health care provider that you had hypertension, sometimes called high blood pressure?

- ☐ Yes ..... *[699]*
- ☐ No (skip to Q105) ..... *[422]*

Q102 How often have you been told that you had high blood pressure?

- ☐ Once ..... *[421]*
- ☐ On two or more occasions ..... *[424]*
- ☐ Only during pregnancy (women only) ..... *[423]*

Q103 Because of your high blood pressure, have you ever been told by a health care provider to: (Check all that apply)

- ☐ Take prescribed medication ..... *[425]*
- ☐ Control your weight or lose weight ..... *[426]*
- ☐ Cut down on salt or sodium in your diet ... *[427]*
- ☐ Exercise more ..... *[428]*
- ☐ Restrict alcohol ..... *[429]*
- ☐ None of the above (skip to Q105) ..... *[671]*

Q104 How regularly do you take your blood pressure medications?

- ☐ Always ..... *[430]*
- ☐ Most of the time ..... *[431]*
- ☐ About half the time ..... *[432]*
- ☐ Less than half the time ..... *[433]*
- ☐ Never ..... *[434]*
- ☐ N/A, I'm not supposed to be taking blood pressure medication ..... *[435]*

CHOLESTEROL

Q105 About how long has it been since you last had your cholesterol checked by a doctor, nurse, or other health care provider?

- ☐ Less than 1 year ago ..... *[436]*
- ☐ 1-2 years ago ..... *[437]*
- ☐ 3-4 years ago ..... *[438]*
- ☐ 5 or more years ago ..... *[439]*
- ☐ Never (skip to Q109) ..... *[440]*
- ☐ Don't know ..... *[441]*

Q106 At that time, did the doctor or health professional say that your cholesterol was...

- ☐ High (over 240) ..... *[442]*
- ☐ Borderline (200-240) ..... *[443]*
- ☐ Normal (less than 200) ..... *[444]*
- ☐ Don't know ..... *[445]*

Q107 Because of your cholesterol, have you ever been told by a health care provider to: (Check all that apply)

- ☐ Take prescribed medication ..... *[672]*
- ☐ Control your weight or lose weight ..... *[673]*
- ☐ Cut down on fats and cholesterol in your diet *[674]*
- ☐ Exercise more ..... *[675]*
- ☐ None of the above (skip to Q109) ..... *[676]*

Q108 How regularly do you take your cholesterol medications?

- ☐ Always ..... *[677]*
- ☐ Most of the time ..... *[678]*
- ☐ About half the time ..... *[679]*
- ☐ Less than half the time ..... *[680]*
- ☐ Never ..... *[681]*
- ☐ N/A, I'm not supposed to be taking cholesterol medication ..... *[682]*

IMMUNIZATIONS

Q109 During the past 10 years, have you had a tetanus-diphtheria shot or tetanus shot?

- ☐ Yes ..... *[448]*
- ☐ No ..... *[449]*
- ☐ Don't know ..... *[450]*

Q110 During the past 12 months, have you had a flu shot? This vaccination is usually given in the fall and protects against influenza for the flu season.

- ☐ Yes ..... *[451]*
- ☐ No ..... *[452]*
- ☐ Don't know ..... *[453]*

Q111 Have you ever had a pneumonia vaccination? This shot was first made available in 1977 and is usually given once in a person's lifetime.

- ☐ Yes ..... *[454]*
- ☐ No ..... *[455]*
- ☐ Don't know ..... *[456]*

CANCER

Q112 A fecal occult blood test is when a bowel movement is tested to determine whether it contains blood. When did you have your most recent fecal occult blood test?

- ☐ Less than 1 year ago ..... *[457]*
- ☐ Over 1 year ago ..... *[458]*
- ☐ Never ..... *[459]*
- ☐ Don't know ..... *[460]*

Q113 A proctoscopic exam is when a tube is inserted in the rectum to check for problems. When did you have your most recent proctoscopic exam?

- ☐ Less than 1 year ago ..... *[461]*
- ☐ 1-2 years ago ..... *[462]*
- ☐ 3-5 years ago ..... *[463]*
- ☐ More than 5 years ago ..... *[464]*
- ☐ Never ..... *[465]*
- ☐ Don't know ..... *[466]*

Q114 Have you had 3 or more blistering sun burns in your entire life?

- ☐ Yes ..... *[467]*
- ☐ No ..... *[468]*
- ☐ Don't know ..... *[469]*

MEN ONLY – WOMEN PLEASE GO TO Q116

Q115 How often do you do a testicular (sex organs) self-exam?

- ☐ Monthly ..... *[473]*
- ☐ Every few months ..... *[475]*
- ☐ Rarely or never ..... *[474]*

WOMEN ONLY – MEN PLEASE GO TO Q121

Q116 A mammogram is an x-ray taken only of the breasts by a machine that presses the breast against a plate. When did you have your most recent mammogram?

- ☐ Less than 1 year ago ..... *[476]*
- ☐ 1 year ago ..... *[477]*
- ☐ 2 years ago ..... *[478]*
- ☐ 3 or more years ago ..... *[479]*
- ☐ Never ..... *[480]*
- ☐ Don't know ..... *[481]*

Q117 A clinical breast exam is when the breast is felt for lumps by your health care provider. When did you have your most recent clinical breast exam?

- ☐ Less than 1 year ago ..... *[482]*
- ☐ 1 year ago ..... *[483]*
- ☐ 2 years ago ..... *[484]*
- ☐ 3 or more years ago ..... *[485]*
- ☐ Never ..... *[486]*
- ☐ Don't know ..... *[487]*

Q118 About how often do you examine your breasts for lumps?

- ☐ Monthly ..... *[488]*
- ☐ Every few months ..... *[490]*
- ☐ Rarely or never ..... *[489]*

Q119 A Pap smear is a test for cancer of the cervix. How long has it been since you had your last Pap smear?

- ☐ Less than 1 year ago ..... *[506]*
- ☐ 1 year ago ..... *[507]*
- ☐ 2 years ago ..... *[508]*
- ☐ 3 or more years ago ..... *[509]*
- ☐ Never (skip to Q121) ..... *[510]*
- ☐ Don't know ..... *[511]*

Q120 Have you ever had a Pap smear where the results were not normal?

- ☐ Yes ..... *[512]*
- ☐ No ..... *[513]*
- ☐ Don't know ..... *[514]*

REPRODUCTIVE HEALTH ISSUES

Q121 Do you plan to have a child (or father a child) in the next two years?

- ☐ Yes (skip to Q124) ..... *[515]*
- ☐ No ..... *[516]*
- ☐ Don't know ..... *[517]*

Q122 The last time you had intercourse, did you or your partner use any method of birth control or family planning to protect against pregnancy?

- ☐ Yes ..... *[700]*
- ☐ No (skip to Q124) ..... *[650]*
- ☐ N/A, I'm abstaining from intercourse (skip to Q124) ..... *[651]*

Q123 Which method was that? (Check all that apply)

- ☐ Withdrawal, pulling out ..... *[652]*
- ☐ Natural family planning, safe period by mucous test or temp ..... *[653]*
- ☐ Safe period by calendar, rhythm ..... *[654]*
- ☐ Diaphragm, condoms or spermicide jelly/cream ..... *[655]*
- ☐ Birth control pill ..... *[656]*
- ☐ Depo Provera or Norplant ..... *[657]*
- ☐ IUD, tubal ligation, vasectomy ..... *[658]*
- ☐ Other ..... *[659]*

Q124 During the past 12 months, have you been counseled on the risks and prevention of sexually transmitted diseases?

- ☐ Yes ..... *[518]*
- ☐ No ..... *[519]*

WOMEN ONLY – MEN PLEASE GO TO Q129

Q125 How old were you when your periods or menstrual cycles started?

- ☐ 0-10 years old ..... *[520]*
- ☐ 11-15 years old ..... *[521]*
- ☐ 16-20 years old ..... *[522]*
- ☐ 21-25 years old ..... *[523]*
- ☐ 26-30 years old ..... *[524]*
- ☐ N/A, I have not had a menstrual cycle ..... *[525]*
- ☐ Don't know ..... *[526]*

Q126 How old were you when your first child was born?

- ☐ 10-15 years old ..... *[528]*
- ☐ 16-20 years old ..... *[529]*
- ☐ 21-25 years old ..... *[530]*
- ☐ 26-30 years old ..... *[531]*
- ☐ 31-35 years old ..... *[532]*
- ☐ 36-40 years old ..... *[533]*
- ☐ 41 years old or older ..... *[534]*
- ☐ N/A, I have not had any children ..... *[535]*

Q127 Are you pregnant now?

- ☐ Yes ..... *[536]*
- ☐ No ..... *[537]*
- ☐ Don't know ..... *[538]*

Q128 How many years has it been since you had your last regular period?

- ☐ Less than 1 year ago ..... *[540]*
- ☐ 1-2 years ago ..... *[541]*
- ☐ 3-5 years ago ..... *[542]*
- ☐ 6-10 years ago ..... *[543]*
- ☐ More than 10 years ago ..... *[544]*
- ☐ N/A, I'm still having regular periods ..... *[539]*
- ☐ Don't know ..... *[545]*

SAFETY AND OCCUPATIONAL HEALTH

Q129 How often do you use seat belts when you drive or ride in a car off-base?

- ☐ Always ..... *[554]*
- ☐ Nearly always ..... *[555]*
- ☐ Sometimes ..... *[556]*
- ☐ Seldom ..... *[557]*
- ☐ Never ..... *[558]*

Q130 Do you ride a motorcycle?

- ☐ Yes ..... *[546]*
- ☐ No ..... *[547]*

Q131 During the past 12 months, how often did you wear a helmet when you rode a bicycle or drove or rode on a motorcycle (motorbike or moped)?

- ☐ Always ..... *[559]*
- ☐ Nearly always ..... *[560]*
- ☐ Sometimes ..... *[561]*
- ☐ Seldom ..... *[562]*
- ☐ Never ..... *[563]*
- ☐ N/A, I don't ride a bicycle, motorcycle, motorbike, or moped ..... *[564]*

Q132 When was the last time someone deliberately tested all the smoke detectors in your home either by pressing the test buttons or holding a source of smoke near them?

- ☐ Less than 1 year ago ..... *[565]*
- ☐ 1 year ago ..... *[566]*
- ☐ 2 years ago ..... *[567]*
- ☐ 3 or more years ago ..... *[568]*
- ☐ Never ..... *[569]*
- ☐ I do not have smoke detectors in my home *[570]*

Q133 During the past 12 months, how often did you wear protective gear such as goggles, shin pads, or helmets when playing sports like racquetball, football, skating, or soccer?

- ☐ Always ..... *[571]*
- ☐ Nearly always ..... *[572]*
- ☐ Sometimes ..... *[573]*
- ☐ Seldom ..... *[574]*
- ☐ Never ..... *[575]*
- ☐ N/A, I do not participate in these types of sports ..... *[576]*

Q134 Do you believe you have a problem with any of the following that is related to your work? (Check all that apply)

- ☐ Hearing ..... *[577]*
- ☐ Skin ..... *[578]*
- ☐ Breathing ..... *[579]*
- ☐ Joints or back ..... *[580]*
- ☐ Other conditions ..... *[581]*
- ☐ None of the above ..... *[582]*

MENTAL HEALTH/STRESS MANAGEMENT

Q135 Would you say that your mental health in general is...

- ☐ Excellent ..... *[631]*
- ☐ Very good ..... *[632]*
- ☐ Good ..... *[633]*
- ☐ Fair ..... *[634]*
- ☐ Poor ..... *[635]*

Q136 During the past 12 months, would you say that you experienced...

- ☐ Lots of stress ..... *[583]*
- ☐ Moderate amounts of stress ..... *[584]*
- ☐ Relatively little stress ..... *[585]*
- ☐ Almost no stress at all ..... *[586]*

Q137 During the past 12 months, how much effect has stress had on your health?

- ☐ A lot ..... *[593]*
- ☐ Some ..... *[594]*
- ☐ Hardly any ..... *[595]*
- ☐ None ..... *[596]*

Q138 During the past 12 months, have you seen a mental health professional?

- ☐ Yes ..... *[611]*
- ☐ No ..... *[612]*

Q139 During the past 12 months, have you had any serious personal or emotional problems?

- ☐ Yes ..... *[587]*
- ☐ No ..... *[588]*
- ☐ Don't know ..... *[684]*

Q140 During the past 12 months, how often have your worries interfered with your daily life?

- ☐ Often ..... *[617]*
- ☐ Sometimes ..... *[618]*
- ☐ Seldom ..... *[619]*
- ☐ Never ..... *[620]*

Q141 During the past 12 months, how often have you been bothered by "nerves" or feeling anxious or on edge?

- ☐ Often ..... *[29]*
- ☐ Sometimes ..... *[34]*
- ☐ Seldom ..... *[39]*
- ☐ Never ..... *[44]*

Q142 During the past 12 months, how often have you been bothered by anxiety attacks (suddenly feeling fear or panic)? Do not include normal reactions to fearful situations.

- ☐ Often ..... *[49]*
- ☐ Sometimes ..... *[57]*
- ☐ Seldom ..... *[58]*
- ☐ Never ..... *[59]*

Q143 During the past 12 months, how often have you been bothered by feeling down, depressed, or hopeless?

- ☐ Often ..... *[621]*
- ☐ Sometimes ..... *[622]*
- ☐ Seldom ..... *[623]*
- ☐ Never ..... *[624]*

Q144 During the past 12 months, how often have you been bothered by little interest or pleasure in doing things?

- ☐ Often ..... *[20]*
- ☐ Sometimes ..... *[21]*
- ☐ Seldom ..... *[22]*
- ☐ Never ..... *[23]*

Q145 During the past 12 months, how many serious personal losses or difficult problems have you had to handle (e.g. promotion passover, divorce or separation, legal action, bankruptcy, a death of someone close, serious illness or injury of a loved one)?

- ☐ 1 serious personal loss or problem ..... *[605]*
- ☐ 2 or more serious personal losses or problems ..... *[606]*
- ☐ No serious personal losses or problems ... *[607]*

Q146 During the past 12 months, how many times did you witness or become involved in a violent fight or attack where there was a good chance of a serious injury to someone?

- ☐ Never ..... *[613]*
- ☐ 1 time ..... *[614]*
- ☐ 2 or 3 times ..... *[615]*
- ☐ 4 or more times ..... *[616]*

Q147 How often do you have any serious problems dealing with your husband or wife, parents, friends, coworkers, or with your children?

- ☐ Often ..... *[597]*
- ☐ Sometimes ..... *[598]*
- ☐ Seldom ..... *[599]*
- ☐ Never ..... *[600]*

Q148 During the past 12 months, have you been separated from your family for at least 30 days in a row?

- ☐ Yes ..... *[589]*
- ☐ No ..... *[590]*

Q149 During the past 12 months, have you been separated from your family due to frequent short trips?

- ☐ Yes ..... *[591]*
- ☐ No ..... *[592]*

Q150 Do you anticipate frequent separations for deployment or TDY?

- ☐ Yes ..... *[625]*
- ☐ No ..... *[626]*

Q151 Do you have a family member that you are responsible for helping who has a serious health problem or other problems?

- ☐ Yes ..... *[644]*
- ☐ No ..... *[645]*

Q152 How often are there people available that you can turn to for support in bad moments or illness?

- ☐ Never ..... *[627]*
- ☐ Hardly ever ..... *[628]*
- ☐ Sometimes ..... *[629]*
- ☐ Always ..... *[630]*

Q153 During the past 12 months, how often did you experience a pleasant change (e.g. promotion, marriage, birth, award, etc.)?

- ☐ 1 major pleasant change ..... *[608]*
- ☐ 2 or more major pleasant changes ..... *[609]*
- ☐ No major pleasant changes ..... *[610]*

Q154 In general, how satisfied are you with your life? (e.g. work situations, social activity, accomplishing your goals)

- ☐ Not satisfied ..... *[601]*
- ☐ Somewhat satisfied ..... *[602]*
- ☐ Mostly satisfied ..... *[603]*
- ☐ Totally satisfied ..... *[604]*

Q155 Would you like to find out about what resources are available for dealing with personal, emotional, stress, or other life problems?

- ☐ Yes ..... *[60]*
- ☐ No ..... *[61]*

END OF QUESTIONNAIRE

The questionnaire is now complete. Thank you for your attention. Please notify the administrator that you have finished.

HEAR 2.1

PRIVACY ACT STATEMENT
AUTHORITY FOR COLLECTION OF INFORMATION INCLUDING SOCIAL SECURITY NUMBER (SSN) Sections 133, 1071-87, 3012, 5031 and 8012, title 10, United States Code and Executive Order 9397.
PRINCIPAL PURPOSES FOR WHICH INFORMATION IS INTENDED TO BE USED This form provides you the advice by the Privacy Act of 1974. The personal information will facilitate and document your health care. The Social Security Number (SSN) is required to identify and retrieve health records.
ROUTINE USES The primary use of this information is to provide, plan, and coordinate health care. As prior to enactment of the Privacy Act, other possible uses are to: Aid in preventive health and communicable disease control programs and report medical conditions required by law to federal, state and local agencies; compile statistical data; conduct research; teach; determine suitability of persons for service or assignments; adjudicate claims and determine benefits; other lawful purposes, including law enforcement and litigation; conduct authorized investigations; evaluate care rendered; determine professional certification and hospital accreditation; provide physical qualifications of patients to agencies of federal, state, or local government upon request in the pursuit of their official duties.
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DEPARTMENT OF THE ARMY
US ARMY MEDICAL RESEARCH AND MATERIEL COMMAND
504 SCOTT STREET
FORT DETRICK, MARYLAND 21702-5012

REPLY TO
ATTENTION OF:

MCMR-RMI-S (70-1y) 21 Feb 03

MEMORANDUM FOR Administrator, Defense Technical Information Center (DTIC-OCA), 8725 John J. Kingman Road, Fort Belvoir, VA 22060-6218

SUBJECT: Request Change in Distribution Statement

1. The U.S. Army Medical Research and Materiel Command has reexamined the need for the limitation assigned to technical reports written for this Command. Request the limited distribution statement for the enclosed accession numbers be changed to "Approved for public release; distribution unlimited." These reports should be released to the National Technical Information Service.

2. Point of contact for this request is Ms. Kristin Morrow at DSN 343-7327 or by e-mail at Kristin.Morrow@det.amedd.army.mil.

FOR THE COMMANDER:

Encl

PHYLLIS M. RINEHART
Deputy Chief of Staff for
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